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FARMERS' BULLETIN No. 1001

OWING FRUIT HOME USE



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WELL-RIPENED sound fruit is healthful. It is also a valuable food. It should form a part of the diet of every person, fresh when possible, or canned, dried, or otherwise preserved.

Home-grown fruit is desirable because:

It reaches the family fresh and in the best possible condition.

The family has fruit which often would not be purchased.

If the proper varieties are selected, a continuous supply of fruit of superior quality may be obtained, regardless of market prices.

Any surplus may be canned, dried, or otherwise conserved for use when fresh fruit is not available.

The care of the home fruit garden provides for congenial spare-time occupation, which is in reality recreation for those who enjoy seeing things grow.

This bulletin aims to furnish, in concise form, information that will be of practical help to the amateur fruit grower.

It deals with the widely grown temperate-climate fruits, such as the apple, pear, peach, plum, cherry, grape, and berries. Lists are given of varieties desirable for the different parts of the country.

Because of the number of fruits considered and the territory covered, cultural directions are necessarily brief, but they cover the most important general points.

GROWING FRUIT FOR HOME USE

By H. P. GOULD, *senior pomologist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry*

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THE POINT OF VIEW

THE COMMERCIAL GROWER thinks and operates in terms of his orchard, carload shipments of fruit, and market prices. The one who grows fruit for home use thinks in terms of individual trees or plants and works to secure a supply for family use. The commercial grower measures his success principally by the effect on his income; the one who grows fruit for home use, by the regularity and quality of the supply that comes to his table or into the hands of his children, and the satisfaction derived from having fruit that is fresh and tree-ripened and the product of his own efforts.

In extensive sections of the country where commercial fruit growing does not exist, the home or farm orchard obviously is the local source of fresh fruit. The supplies of fruit shipped into rural communities and the small towns and villages are apt to be scanty in quantity and frequently lacking in quality and freshness by the time the consumer gets them. Furthermore, in many instances the family income does not permit the purchase of fresh fruit in the quantities desirable for the diet. Unless it is home-grown, the family will get along without it in such cases.

However, the home orchard will not take care of itself and produce satisfactory fruit. A certain amount of work in pruning, training, cultivating, and fertilizing is necessary for success. Still more important is the spraying of most kinds of fruit to control insect pests and fungus diseases. In few parts of the United States can even fairly satisfactory apples, peaches, plums, or pears be grown without spraying at least three or four times during the season. Therefore in considering a home fruit garden, definite plans should be made to spray it when necessary. Unless such spraying is done the planting should be limited to those fruits that can be grown without it. These

include berries of all types, and, under some conditions, grapes and sour cherries. Even these fruits are subject to disease and insect troubles that are sometimes destructive.

THE PLAN

The ideal fruit garden or home orchard should contain several different kinds of fruit, represented in many cases by a considerable number of varieties, ripening one after another over a long period. Large yields, good shipping quality, and attractiveness in appearance may be made secondary to high dessert quality or special excellence for culinary purposes.

If the fruit garden is planned carefully and is not too restricted in size, it may be made to supply fruit continuously throughout the year, in the fresh state, canned, or otherwise conserved. Whether long-keeping winter apple and pear varieties should be included in the planting will depend, at least in part, on the facilities available for storing the fruit.

Throughout a large part of the country one may grow in the same garden, if he desires, and if it is of sufficient size to permit it, the following fruits: Apples, pears, peaches, plums, cherries, quinces, strawberries, raspberries, blackberries, dewberries, currants, gooseberries, and grapes. In the colder sections the winters are too severe for peaches and also for some of the other fruits named unless they are protected, while in the warmer parts apples, cherries, currants, gooseberries, and certain varieties of several of the other fruits fail because they are not adapted to the long, hot summers and mild winters. But in these warmer regions Japanese persimmons succeed, and in some of them figs and certain other fruits can be planted successfully. Therefore, one of the most important features of the plan for the home fruit plantation is the selection of kinds of fruit and varieties which will do well in the given locality and will serve best the purpose for which they are desired.

The diagram shown in figure 1 may be helpful to the amateur fruit grower in planning the arrangement of the area he is to use for fruits. It represents a half acre of land divided with a view to planting at specified distances apart a given number of different kinds of trees and other fruit-bearing plants, including also a border wide enough to prevent the undue encroachment of the trees on adjacent land.

The fruits provided for in the diagram (fig. 1), by rows, are as follows:

Rows *A* and *B*: Nos. 1 to 5, apples; No. 6, apricots.

Row *C*: Nos. 1 to 3, pears; Nos. 4 and 5, sour cherries; Nos. 6 and 7, sweet cherries.

Row *D*: Nos. 1 to 5, peaches; Nos. 6 to 9, plums.

Rows *E*, *F*, and *G*: Section 1, raspberries (three varieties); section 2, blackberries (two varieties) and dewberries (one variety); section 3, currants (two varieties) and gooseberries (one variety); section 4, strawberries (four varieties).

Row *H*: Grapevines, to be trained on a wire trellis. A fence may also be used as a trellis.

Quince trees are not specifically provided for in this plan; but since they require only a small amount of space and not more than one or

two would be needed as a rule, they could be planted between the apple trees or otherwise placed. In many parts of the country quinces might well be substituted for the apricots suggested for No. 6 in rows *A* and *B*.

It is not assumed that this plan will fit the exact conditions in any particular case, but it shows the possibilities of obtaining a wide range in fruits from a small area of land.

Though not indicated in the diagram (fig. 1), it is possible to plant between apple trees when set 32 feet apart smaller growing trees, such as the peach or plum, placing one between each two trees in the row as well as planting a row in the center of the spaces between the tree rows. This is a temporary arrangement, however, since the apple trees will eventually need all the space. Before crowding begins, inter-planted trees should be removed.

Currants and gooseberries commonly do better, especially in the southern limits of their range, if grown where there is partial shade. This sometimes can be provided by planting them between fruit trees. Raspberries and blackberries are sometimes planted between trees, but the practice is not advised unless the soil is naturally moist and fertile.

Vegetables may also be grown between the trees while the latter are small and do not shade the ground very much. Some of the early maturing vegetables may even be grown between rows of strawberries during their first season. A row or two of strawberries may be planted in the middle of the space between two rows of trees and continued for a time.

THE SITE

The location of the land on which the fruits are planted, other things being equal, should be convenient to the house. It should be well drained, since fruit trees cannot thrive in poorly drained soil. The air drainage also must be good. Cold air settles to the lowest levels, and if a site is so located that cold air settles over it from some surrounding higher elevation, the fruit blossoms are likely to be killed

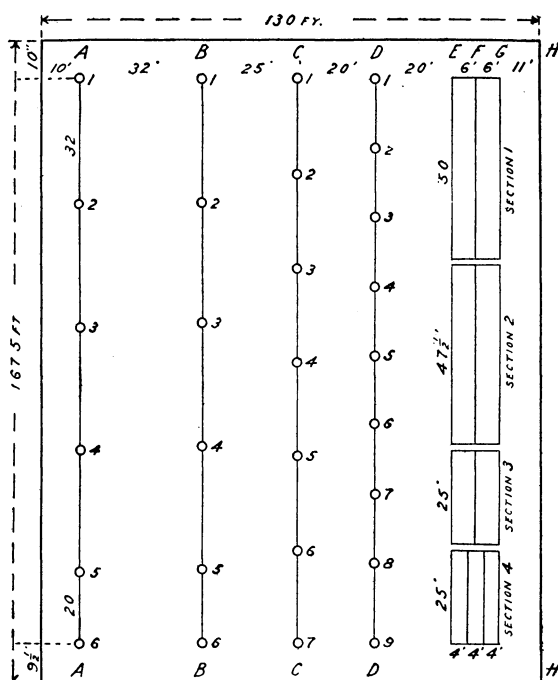


FIGURE 1.—Suggested arrangement for a half-acre fruit garden.

by untimely spring frosts, or the fruit may be injured by freezes in the autumn when sites located on the sides of slopes or at points which are higher than the surrounding area escape such injury.

Where the surface of the land is much broken and characterized by high hills, the farm buildings commonly occupy the higher points. In such instances the natural site for the fruit garden or home orchard is near the house, where both soil and air drainage usually are adequate. In other cases the buildings occupy low sites, which are likely

to be frosty, and it would be better to plant the family orchard on higher land.

Most fruits can be grown on a wide range of soil types, but where possible it is better to avoid very light sandy soils and heavy clays. The latter are often difficult to manage in the intensive way necessary for the best success with fruit, while the very light soils are likely to be affected by the various extremes of heat, cold, and drought.

The character of the subsoil is perhaps of greater importance than that of the surface soil. In many instances fruit trees planted where the surface soil appeared to be suitable have failed because of hardpan or rock a few inches or perhaps even 2 or 3 feet below the surface,

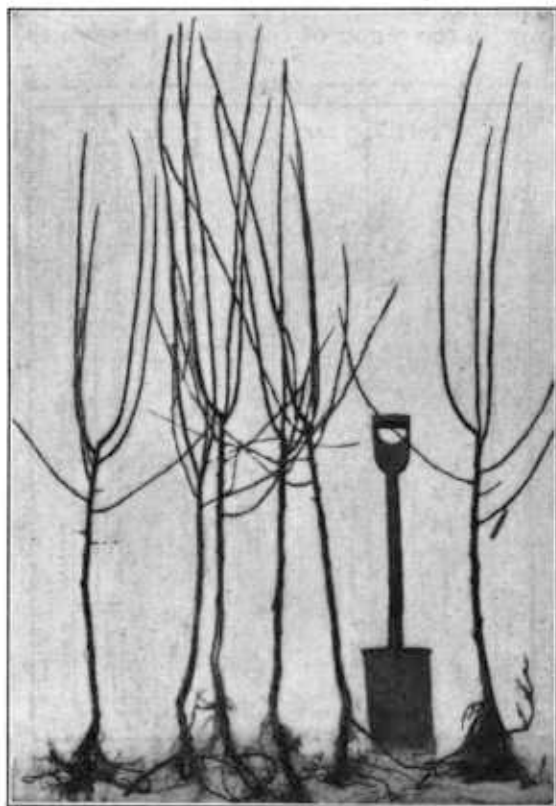


FIGURE 2.—Well-grown 2-year-old Stayman Winesap apple trees as received from the nursery

which prevented a deep penetration of the roots and also made a very shallow and insufficient moisture reservoir. A very coarse gravelly subsoil is little better so far as its effect on tree growth is concerned. A deep subsoil which is friable and porous enough to permit a ready penetration of the roots and a free movement of soil moisture is essential for satisfactory results.

OBTAINING NURSERY STOCK

Good nursery stock of suitable kinds and variety is fundamental to success in fruit growing. The average small planter is not in direct touch with nurserymen. His relation is more likely to be through a

salesman acting as agent for a nurseryman. Not infrequently the salesman's visit brings the first suggestion that some fruit trees may be planted. The prospective inexperienced grower without having given careful thought regarding the fruits suited to his conditions and needs is not in a position to order very intelligently. The salesman may or may not be qualified to advise to the best advantage. Knowing the appeal of novelties, he often is inclined to place undue emphasis on high-priced novelties which at best are of unproved value. In buying of an agent the buyer should make sure that the agent is a bona fide representative of a reliable nursery.

The selection of varieties for home planting is a very personal matter. It should take into account the likes and dislikes of the family as well as the adaptability of the varieties to the conditions. It needs careful consideration, more so than it is likely to receive on the spur of the moment when the salesman calls. It is better, therefore, for the prospective grower to determine for himself with deliberation what he wants to plant. It is well for him in the beginning to procure one or more good nursery catalogs and to study them thoroughly. Besides, a prospective planter may avail himself of the suggestions of experienced fruit growers in his community, the experiment station, or the extension division of the college of agriculture in his own State, or the United States Department of Agriculture.

It is difficult to describe good nursery stock. A good root system is essential. A tree or bush, as a rule, should have several main roots and many smaller ones when received from the nursery. Good grades of several different kinds of fruit trees as received from the nursery are shown in figures 2 to 6. All trees as received from the nursery should bear a State inspection certificate indicating freedom from disease and insect pests.

Only plants or trees that have made a strong growth in the nursery should be planted. Plants making weak growth in the nursery are

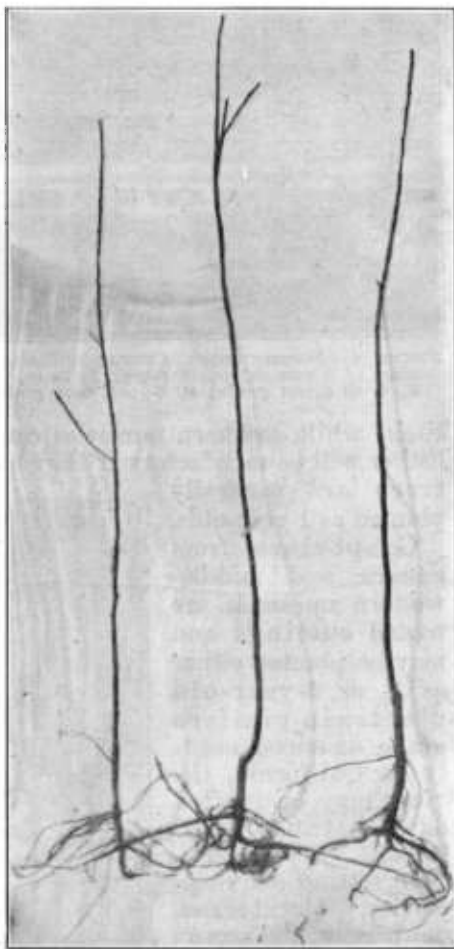


FIGURE 3.—Well-grown 1-year-old apple trees as received from the nursery. They are 5 to 6 feet tall. Branching occurs in the second year's growth in the nursery, as shown by figure 2.

Only plants or trees that have made a strong growth in the nursery should be planted. Plants making weak growth in the nursery are

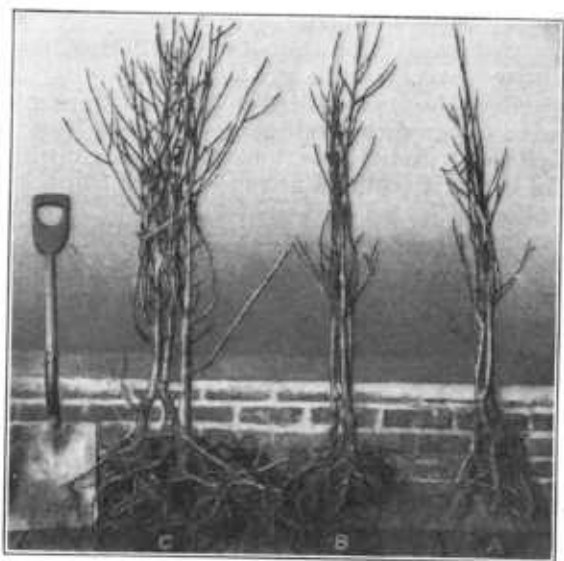


FIGURE 4.—Nursery stock, showing different grades or sizes of 1-year-old peach trees: *A*, 3- to 4-foot grade; *B*, 4- to 5-foot grade; *C*, 5- to 7-foot grade.

likely to show lack of vigor when planted in the orchard. Vigorous, No. 1 nursery stock is to be recommended, even though the initial cost may be slightly higher than for No. 2 trees.

Apples, pears, quinces, plums, and cherries may be planted in the orchard either as 1- or 2-year-old trees; that is, after the tops have grown in the nursery either one or two seasons. Northern nurseries, with a relatively short growing season, usually offer only 2-year-old trees of these

kinds, while southern nurseries can usually supply 1-year-old trees. Either will be satisfactory if they have attained sufficient size. Peach trees are generally planted as 1-year-olds.

Grapevines from eastern and middle-western nurseries are rooted cuttings and may be planted either as 1- or 2-year-old plants; in vinifera grape districts, mostly in California, the vines may be grafted on resistant understocks.

In setting out raspberries, blackberries, dewberries, and strawberries, young plants which grew the preceding season are generally used except when they are handled in the autumn. In that case plants of the current season's growth are used.

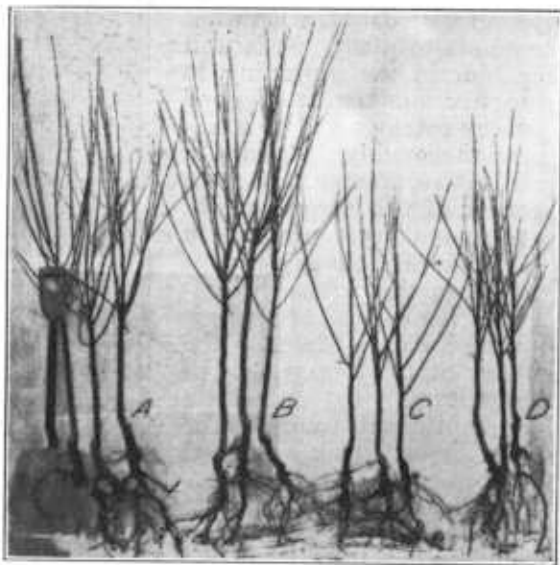


FIGURE 5.—Sour cherry trees representing different grades of nursery stock, as follows: *A*, Two-year-old Large Montmorency on mazzard understocks, $\frac{5}{8}$ -inch grade, 5 to 7 feet; *B*, same as *A*, except that the trees are on mahaleb understocks; *C*, 1-year-old Large Montmorency on mazzard understocks, $\frac{5}{8}$ - to $\frac{11}{16}$ -inch grade, 3 to 4 feet; *D*, 1-year-old Large Montmorency on mahaleb understocks.

DWARF TREES

The use of dwarf, instead of the ordinary standard trees, is of more or less interest to planters of small areas. Dwarf trees are produced by propagating them on certain stocks or roots which because of their inherently restricted habit of growth restrict also the size of the tops that have been grafted or budded on them.

Earliness of bearing and exceptionally high quality of the product are generally claimed for dwarf trees, although they have sometimes proved disappointing in these respects. Dwarf apple and pear trees have their place, however, in the garden or yard, especially under intensive methods of culture, where the space is too small to admit readily of the development of standard trees.

SEASON OF PLANTING

In the North and wherever the winter conditions are severe on plant life, either from low temperatures, drying winds, or other causes, fruit trees and plants are usually set out in the spring as early as the soil is in suitable condition for working. It is very important that they be set out while the plants are perfectly dormant and before the buds have started. Many failures result from delaying the planting until the buds have started into growth.

In middle latitudes and in the South, where winter conditions are favorable, the planting of fruit trees in the fall, after well-matured nursery stock can be obtained, is widely practiced and is usually preferable to spring planting. In some parts of the South planting may be done at almost any time during the winter. Grapevines and most berry plants, however, are set in the spring.

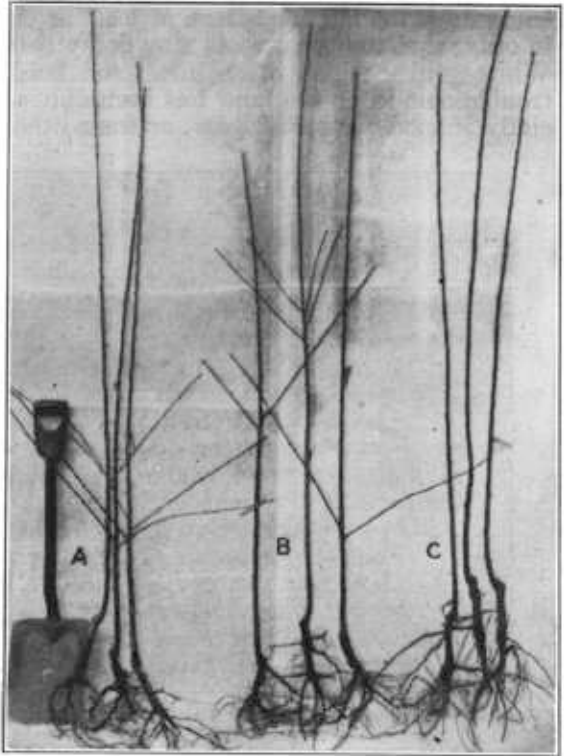


FIGURE 6.—Sweet cherry nursery stock: A, 1-year-old Windsor trees on mahaleb understocks, $\frac{5}{8}$ - to $\frac{1}{2}$ -inch grade (the branching is characteristic of this variety); B, same as A, except that the trees are on mazzard understocks; C, 1-year-old Schmidt trees on mahaleb understocks, $\frac{5}{8}$ - to $\frac{1}{2}$ -inch grade.

PREPARATION OF THE SOIL

If the prospective planter prepares the soil where his fruits are to stand as thoroughly as he should prepare his garden before planting vegetable seeds, the subsequent growth of his fruit trees will amply repay him. Where the site selected is in sod, it is well to cultivate it during one season at least after the sod is plowed under, in order that the grass roots may decay before the fruits are planted. White grubs, which often infest sod land, are not so likely to be troublesome after the land has been cultivated for one season, especially if used for beans, peas, or some other crop not much attacked



FIGURE 7.—Peach trees heeled-in. They may be held in good condition in this manner for some time.

by this insect. Freeing the soil from white grubs is particularly important where strawberries are to be planted.

Sometimes the places selected for trees are in a yard which the owner desires to retain as a lawn. In this case the best course is to spade up the soil deeply over an area of several square feet where each tree is to stand.

HANDLING THE STOCK RECEIVED FROM THE NURSERY

Many of the trees and berry plants set out in the home orchard and garden fail to grow because they are not properly handled.

Every reasonable precaution should be taken from the time the trees and other plants are dug in the nursery until they are planted to prevent the roots from becoming dry. If trees and other plants are received packed in bales or boxes they should be unpacked promptly, unless they are to be planted without material delay. If the plants are to be set soon after being received, almost any temporary means of protecting the roots so that they will not become dry will suffice. Wet gunny sacks, an old horse blanket, or some other

material that has been thoroughly moistened, if spread over the roots, will serve the purpose. If it is necessary to delay planting for any considerable time, the trees should be heeled in. This operation is illustrated in figure 7. A trench is opened of sufficient size to receive the roots. If the trees are tied in bundles, they should be loosened and the roots separated when they are placed in the trench so that the soil can be worked in among them readily and packed rather firmly, thus largely excluding the air; and, finally, enough soil should be heaped over the roots to prevent their drying out. In this way the stock can be held in good condition for any reasonable length of time, but the planting should be done before the buds start into growth in the spring. If plants appear to be very dry when received, the roots should be soaked in water before being planted, particularly if the soil is dry.

PLANTING

Before the planting operation actually begins, the exact spots to be occupied by the individual trees or the rows where the small-fruit plants are to stand should be designated. The distances between most

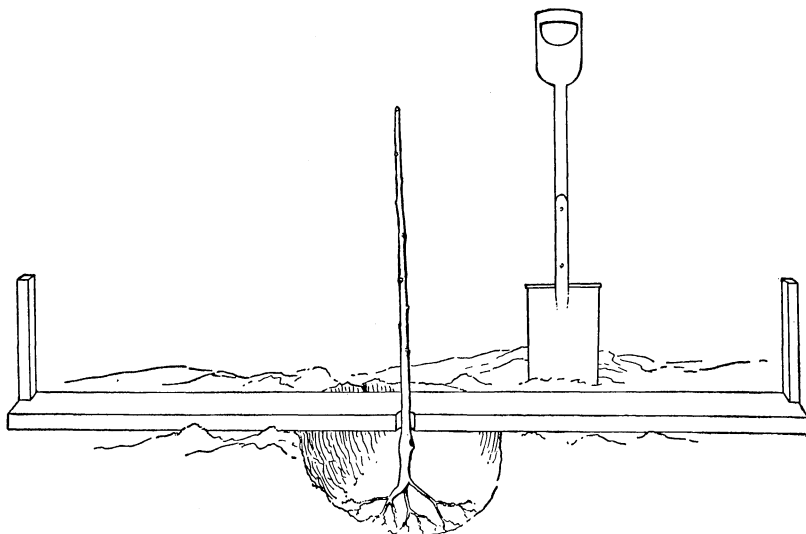


FIGURE 8.—Using a planting board in setting a tree. The board was put in place, with the center stake where the tree is shown and the end stakes as indicated. It was then taken up and the hole dug; then the board was returned to its former position, as indicated by the end stakes (which have not been moved). The tree is in the position of the center stake.

of the various kinds of fruit trees are suggested in figure 1. It should be understood that these distances may be varied to meet conditions, though more, rather than less, space between trees is desirable. Apricots may be planted the same distance apart as peach trees; Japanese persimmons and figs also are planted about the same distance apart, or a little nearer together, though in California the larger growing varieties of figs should be spaced about the same as apples. Quinces, being smaller, may be planted about 14 to 16 feet apart.

The distance between the rows of bush fruits is also shown in figure 1. The spacing of the plants in the rows, in general, should be about as follows: Blackberries and raspberries, 3 feet; dewberries, currants, and gooseberries, 4 feet. Strawberries should be set in rows 3 to 4 feet apart and the plants 12 to 24 inches apart in the row. Grapes should be 8 to 10 feet apart each way.

If trees are to be planted in a yard or along a fence where it is impracticable to plow and cultivate the land, due care should be exercised in placing them properly. The relation which the trees will

have to adjacent buildings or to the landscape when they attain considerable size should be carefully studied in order to avoid irreparable mistakes.

The first row should be located at the desired distance from the base or side of the plot to be planted. This may be half the distance between the rows or closer, according to circumstances (fig. 1). Then stakes should be driven where the trees are to stand, and the next rows laid off in the same manner till the whole plot is staked out. In planting the trees a planting board, as shown in figure 8, may be used to advantage.

The trees should be planted at the same depth or only slightly deeper than they stood in the nursery, and the holes should be broad enough to receive the roots without bending them from their natural positions. This applies also to raspberry, blackberry, currant, and other small-fruit plants with the exception of strawberries. Strawberry plants should be set at such a depth that the crown of the plant is even with the surface of the ground. If they are planted deeper than this they are likely to smother; if they are planted less deep, the roots are likely to dry out.

Under some conditions, in planting small fruits, it is convenient to open a furrow with a plow along the lines which mark the location of the rows. If this is done, the work required in making the holes for individual plants is considerably lessened, although in the home fruit plantation it usually will be more convenient to dig a hole for each plant.

The broken ends of roots should be cut off and any long slender roots should be shortened to correspond to the main root system. Small-fruit plants should be treated in about the same way, though in actual practice little attention is given to trimming the roots before the plants are set out.

In filling the holes after the trees are placed in position, work finely pulverized fertile topsoil among the roots. After a few shovelfuls of topsoil have been placed about the roots, slightly raise and lower the tree two or three times. This will tend to work the fine soil in among the roots. As the filling progresses, firm the soil about the roots with the foot or in some other effective way. Of all the operations connected with planting, the firming of the soil about the roots is per-



FIGURE 9.—A 1-year-old Stayman Winesap apple tree being pruned immediately after planting.

haps the most important, and it should be done very thoroughly. Finally, fill the holes up even with the surface.

In connection with the planting or immediately following it, the tops of fruit trees should be shaped with a view to training them in their later development. The details of shaping the tops of apple and peach trees at the time they are planted are shown in figures 9, 10, 13, and 14. These are discussed on page 13 under the head Pruning. Sometimes when the trees are planted in the autumn, pruning is deferred until the following spring.

In planting raspberries, blackberries, currants, and gooseberries the tops should be cut back to a height of about 6 inches. If currants and gooseberries have particularly strong root systems, the tops are sometimes left 10 to 12 inches high.

CULTURAL METHODS

The cultural methods employed will inevitably depend to a considerable extent on conditions. In many cases they will represent a compromise between the ideal and what is practicable under the circumstances.

Where the home plantings consist of a few trees, berry bushes, and the like in the family garden, they will usually receive much the same cultural attention as the garden area. Trees planted along the borders of a lot, or in a yard about the buildings will usually be in sod. Larger areas devoted to a home orchard may receive more highly specialized attention.

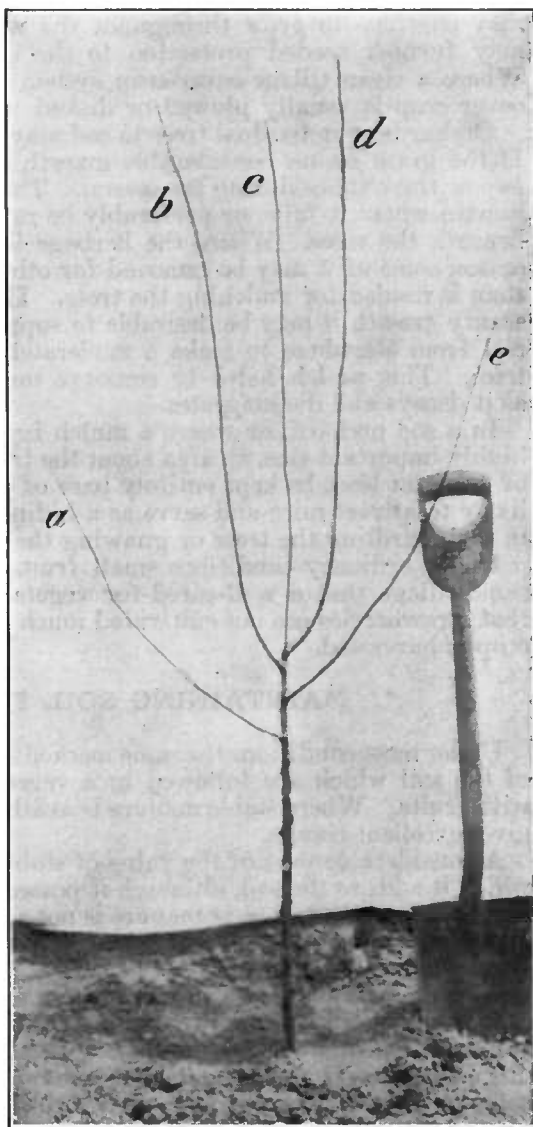


FIGURE 10.—A 2-year-old apple tree, top unpruned, branched, as received from the nursery. (See text, p. 13, for details.)

All things considered, probably the ideal treatment consists of rather shallow tillage during the early part of the season, sufficient to hold weed growth in check, followed later by a cover or green-manure crop. The handling of such a crop will depend on prevailing conditions. In the warmer sections of the country, the cover crop may continue to grow throughout the winter. In other sections it may furnish needed protection to the roots against winter injury. Where a clean tillage-cover-crop system of culture is practiced, the cover crop is usually plowed or disked into the soil in early spring.

Orchards or individual trees in sod may be handled in various ways. If the grass makes considerable growth it should usually be mowed two or three times during the season. The herbage may be allowed to remain where it falls, or preferably be raked up and used as a mulch beneath the trees. Where the herbage is mowed several times in a season some of it may be removed for other purposes if there is more than is needed for mulching the trees. If the grass is making only a scanty growth it may be desirable to supply enough additional material from elsewhere to make a moderately heavy mulch beneath the trees. This mulch helps to conserve moisture and supplies humus as it decays and disintegrates.

In a sod orchard, or where a mulch is placed about the trees, it is highly important that an area about the trunks of the trees in a radius of 3 feet at least be kept entirely bare of all herbage; otherwise, it is likely to attract mice and serve as a hiding place for them and result in their girdling the trees or gnawing the bark from the larger roots.

Under ordinary conditions small fruits should be given about the same tillage that a well-cared-for vegetable garden receives, except that strawberries are not cultivated much in the spring until after the crop is harvested.

MAINTAINING SOIL FERTILITY

Under most conditions the same methods of maintaining the fertility of the soil which are followed in a vegetable garden are successful with fruits. Where stable manure is available its liberal use generally gives excellent results.

A considerable part of the value of stable manure lies in the humus which it adds to the soil, although it possesses value as well because of its plant-food content. If manure is not available, however, it may be beneficial to work into the soil leaves, cornstalks, straw, or other refuse vegetable matter that will decay readily. Under some conditions rye or a legume may be sown in the autumn or after the season's cultivation is ended, and plowed under the following spring. Other cover crops may also be used as conditions permit. The essential thing in this connection is an abundance of vegetable matter in the soil. This helps in various ways to make the soil productive, and, along with the humus, to increase the moisture-absorbing and moisture-holding capacity of the soil.

In most cases the application of quickly available forms of nitrogen to young trees will stimulate a more vigorous growth than would otherwise occur. If the soil is cultivated it would probably be sufficient to apply a quarter to a half pound of nitrate of soda, or its equivalent in nitrogen in some other form, to an apple tree 1 or 2 years

old and up to 2 or 3 pounds to trees 8 or 10 years old, according to growth conditions. For trees in sod, these applications should be increased for good results. On moderately fertile soils, nitrogenous fertilizers are generally all that is required for trees. For strawberries, a complete fertilizer should be used in most sections unless manure is available. A high-grade complete fertilizer applied at the rate of 1,000 pounds per acre in the fall will ordinarily give good results on strawberries.

In the management of fruit trees, especially those under "sod culture," nitrogen in some quickly available form, such as nitrate of soda, sulphate of ammonia, or one of the various other nitrogen carriers, applied broadcast about the time the buds begin to swell in the early spring at the rate of 2 to 4 pounds per tree to peaches and 4 to 8 pounds to bearing apple trees, depending on their size and condition, more often produces beneficial results than any other one kind of plant food.

PRUNING ¹

To many inexperienced growers the question of how and when to prune trees appears to be very complicated. If certain basic principles are kept in mind, however, it is possible for even the inexperienced grower to do quite a satisfactory job of pruning trees.

The purpose of pruning is to develop the tree so that it will have a maximum of strength to carry a load of fruit and maximum bearing capacity. A safe rule in pruning trees, particularly young trees up to bearing age, is to prune them as little as will accomplish the specific purpose.

TIME TO PRUNE

Pruning of fruit trees in general should be done during the dormant season, preferably in the spring after danger of severe winter freezing is past but before growth of trees has started.

PRUNING THE YOUNG TREE

The first pruning should be done at the time the trees are planted. If the trees, when obtained from the nursery, are unbranched whips, the first pruning should consist simply of heading them back to a height of 3½ to 4 feet (fig. 9). If the tree as received from the nursery has several good side branches well-spaced along the trunk, certain of these branches can be left to form the framework or scaffold branches of the tree. In general, these branches, when it is possible to so select them, should point in different directions and should be spaced not less than 6 inches apart up and down the trunk. Usually not more than three or four such branches should be left at the time of setting the trees. A fruit tree that has made two seasons' growth in the nursery normally has several side branches when received by the grower, as shown in figure 10. The branches on this tree are too close together, up and down the trunk. Probably the one marked *b* should be removed entirely; *d* appears to be the leader, or strongest growing branch, and it should be left as it is; *c* may be cut

¹ Discussion of pruning in part by J. R. Magness, principal pomologist, Division of Fruit and Vegetable Crops and Diseases.

back a few inches in order to give *d* a slightly greater dominance as the leader; *e* may be left without any pruning, or in some cases such a branch might be clipped back slightly to make a better balance with *a*. As this tree grows during the first season after planting, side branches normally will develop along the leader *d*, which can be selected to extend the number of main limbs

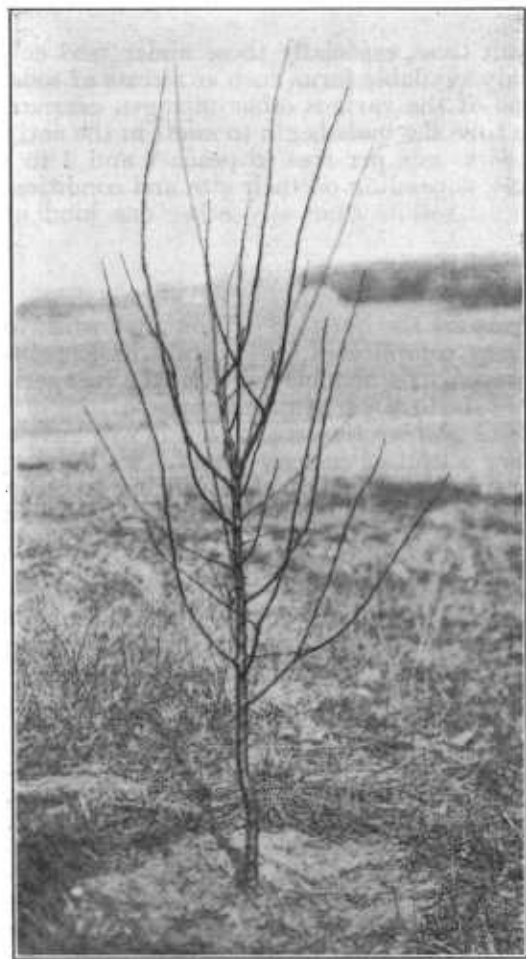


FIGURE 11.—A Delicious apple tree, grown 1 year in the orchard, as it appeared before it was pruned.

represented by branches *a*, *c*, and *e* when the tree was first formed. At the end of the first season in the orchard, a tree so trained will approach in appearance the one shown in figure 11. The same tree after it was pruned is shown in figure 12. A well-branched, unpruned, 1-year-old peach tree at the time of planting is shown in figure 13. How it was pruned after it was planted is shown in figure 14.

The principal pruning consists in cutting back the branches to short spurs, leaving at least one well-developed leaf bud on each spur. The spurred effect of the trunk after such pruning is seen in figure 14. The trunk was topped at a height of about 5 feet. This type of pruning contrasts strongly with the older practice of cutting back the top of a peach tree at the time of planting to an unbranched stem 2 to 3 feet tall.

A tree pruned as in figure 14 is shown in figure 15 in the early part of the growing season following planting. The buds left on the spurs have sent out new shoots in most cases. Two or three spurs which failed to start into growth can be seen. The next step is seen in figure 16, which shows the tree shown in figure 15 after the framework branches had been selected and the others removed. Pruning from this time until the tree comes into bearing will be mainly for the purpose of training. As the growth develops and the branches increase in number and size a little corrective pruning is likely to be needed. Some

of the limbs may crowd; parallel branches may develop; such conditions should be corrected by cutting out the less important branches. Occasionally a limb may outgrow the others and need to be cut back to keep the tree reasonably symmetrical, though very little heading back should be done until later in the life of the tree; and even then the heading back will probably be for the purpose of thinning the fruit or stimulating new growth at local points.

By looking first at a tree pruned like that in figure 16 and then at that shown in figure 23, one can readily envision the development of the tree.

Pruning an apple tree in the winter after it has been 1 year in the orchard will consist of a further selection of branches to serve as the main scaffold limbs (figs. 11 and 12). After these branches are selected, others should be removed by being cut close to the trunk. In general, not more than four or five branches that come off from the trunk in different directions at intervals of several inches should be selected. If a tree has made good growth the first year after it is out and if it was not headed too low when planted, a good selection of branches is usually available. In general, the top most branch should be one making a somewhat stronger growth than any of the lower branches. If the branches are well spaced along the trunk, the trunk will be of a larger diameter than the branch which rises from it. Such a union between trunk and branch gives the strongest possible crotch. The pruning of a 2-year-old apple tree following its first season's growth in the orchard does not differ in principle from the pruning of a tree set as a 1-year-old. A tree so pruned and trained does not break down under the stress of a heavy crop of fruit or from

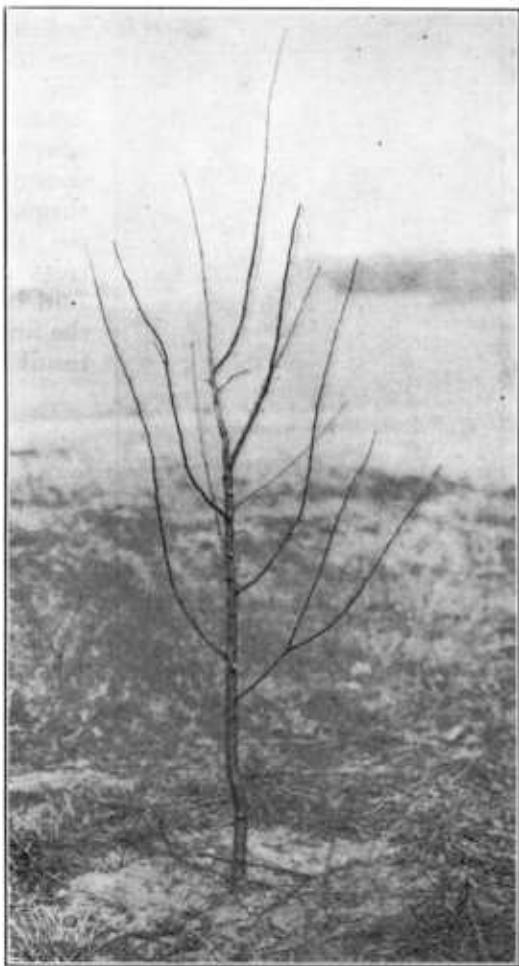


FIGURE 12.—The tree shown in figure 11 after it was pruned.

heavy winds, as does a tree with all its framework branches clustered close together on the trunk (fig. 17).

Figure 18 shows a Winesap apple tree at the end of the second growing season before it was pruned, and figure 19 shows the same tree after it had been pruned. It will be noted that none of the branches has been headed back. Pruning has consisted of taking out the branches that were not needed to form the framework of the tree. After the second spring and until the trees are in bearing condition, pruning should consist simply of a light thinning-out each season. Overpruning of trees through this stage is far more serious than underpruning. If the trees are well shaped and the scaffold branches well selected during the first 2 years, no great harm will result if little pruning is done dur-

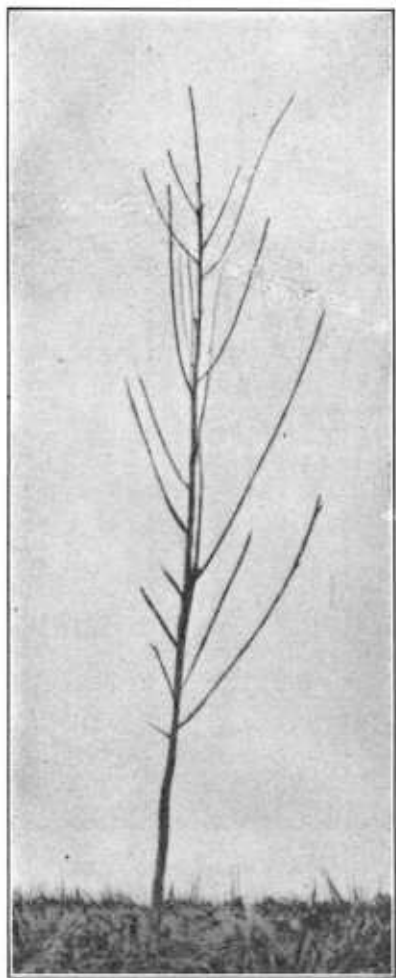


FIGURE 13.—A well-branched 1-year-old peach tree, unpruned, as received from the nursery, at time of planting.

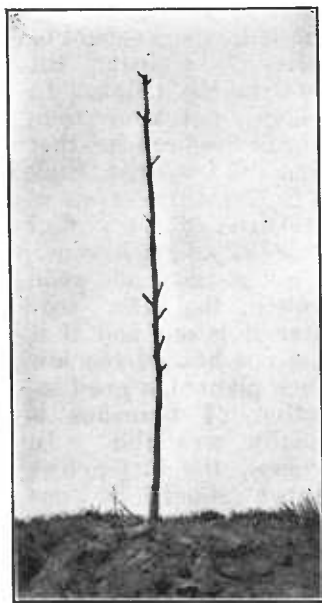


FIGURE 14.—The peach tree shown in figure 13 after it was pruned.

ing the years following, until the trees are well into bearing. In general, the more rapidly the trees increase in size and the greater the foliage area they carry, the earlier will fruit production begin.

Figures 20 and 21 show a 4-year-old York Imperial apple tree, before and after pruning, respectively. These trees are just ap-

proaching bearing age. As in case of the younger apple trees (figs. 12 and 19), the pruning of this 4-year-old tree has consisted mainly in removing entirely the branches that were not needed in forming the top and would have made it too dense and crowded if allowed to remain.

Figures 22 and 23 show the pruning of a bearing peach tree 4 years of age, the pruning consisting of little else than the removal of



FIGURE 15.—A peach tree pruned as shown in figure 14 several weeks after it started into growth.



FIGURE 16.—The same tree shown in figure 15 after the branches to form the framework of the top had been selected and the others cut off close to the trunk.

superfluous branches. A few of the terminal shoots have been headed back to maintain the symmetry of the tree. Had the terminal growth the previous season been very strong and had no injury to the buds from adverse conditions occurred, considerable cutting back of the terminal shoots might have been advisable, both as a means of thinning the crop and for its effect on stimulating the bearing wood for the next year.

PRUNING THE BEARING TREE

In general, peach trees require much heavier cutting than apple or pear trees if they are to be kept in satisfactory bearing condition. The fruit of peach trees is borne on the previous season's growth, and it is necessary that a strong growth should develop each season to keep the trees in satisfactory producing condition. If too much bearing wood is left on the trees during any season, the growth made the following season is reduced and production the next season thereafter will be correspondingly reduced. Therefore it is good practice



FIGURE 17.—An apple tree with trunk split in three sections as a result of having all the main branches centered at nearly the same level instead of well distributed up and down the trunk.

to give peach trees a fairly heavy pruning each spring in order to maintain them in vigorous condition.

This pruning in peach trees should consist of thinning out shoots and heading back to reduce the fruit-bearing surface. Much of the thinning of the peach crop is done by pruning. Such pruning should be delayed until the condition of the buds can be determined in the spring. Frequently peach fruit buds are killed in part or entirely by low winter temperatures. If only a few buds are alive in the spring, little pruning should be done that year.

With apple and pear trees, the fruit is produced primarily on spurs which may be on relatively old wood. Therefore the bearing surface does not need to be renewed each year, as with peaches. Consequently apple and pear trees require only a light annual pruning after they have come into bearing, in order to prevent the top from becoming too thick and bushy and to facilitate spraying and other orchard operations. If the pruning is done each year, it should consist only of a light thinning out, removing primarily the weakest-appearing or

thinnest wood. A thorough pruning of bearing trees once in 3 or 4 years is usually ample, although a light pruning each year rather than a heavier pruning at longer intervals is preferable.

The shape that a tree will assume is determined largely by the characteristics of the variety. Some varieties, such as Stayman Winesap, Rhode Island Greening, McIntosh, and many others, tend to develop a wide, branching top. Other varieties, such as Baldwin, Delicious, and particularly Northern Spy, tend to be much more upright. It is impossible to change these natural tendencies greatly by pruning treatments, and, in general, it should not be attempted. The tree should be given plenty of space to develop its natural form. The most important consideration in the whole life of a tree from the standpoint of pruning is to make the proper selection of branches spaced at considerable intervals up and down the trunk during the first year or two after the tree is planted. If branches are properly selected at that time, the tree will develop a strong trunk and main-branch system. During the bearing life of the tree, pruning can be used to thin out the top and give better quality fruit with better color and better size than results if the tree is unpruned. Overpruning, however, is always a more serious mistake than underpruning; throughout the life of an apple or pear tree cutting should be held to a minimum.

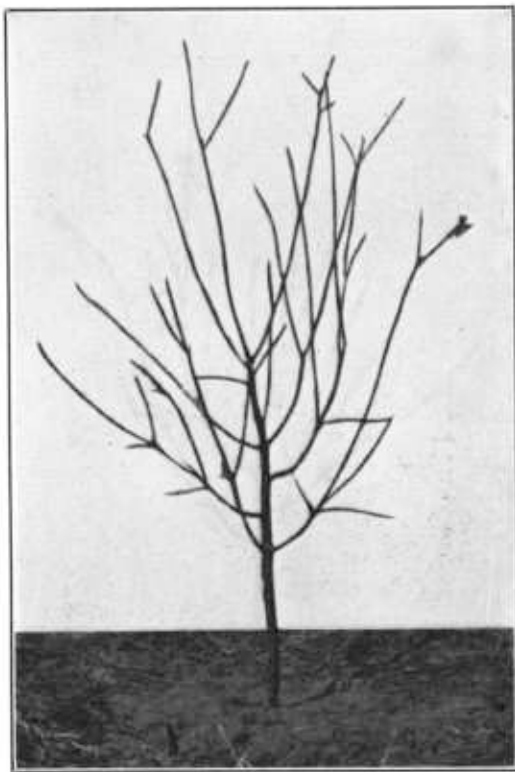


FIGURE 18.—A Winesap apple tree, after its second growing season in the orchard, before being pruned.

The pruning of cherry, plum, and apricot trees involves the same general principles as the pruning of apple and peach trees. The habit of fruiting of different kinds, and, to some extent, of different varieties, may, in some cases, determine the details of the pruning. A tree that produces fruit mostly on spurs will naturally require somewhat different treatment from a peach tree, for instance, which bears its fruit along the shoots or twigs of the previous season's growth. All are alike, however, in needing to have their tops kept from becoming so dense that spurs and other types of fruit-bearing wood are crowded and shaded enough to be weakened or even killed. The denseness of the tops may be controlled by thinning out the

branches as may be necessary, removing the weaker or "thin" limbs where such occur. If a cherry tree is making a very strong annual growth, slight heading back will usually help to stimulate the development of fruit spurs. The apricot produces most of its fruit on short laterals that develop from the older wood. Pruning with a view to the development of an abundance of these lateral shoots and the maintenance of their vigor becomes one of the essential features in the management of apricot trees. Under some growth conditions

slight heading back of the annual growth or even cutting back the bearing lateral shoots will help to develop and maintain an abundance of bearing wood.

PRUNING GRAPEVINES

At the time of planting, grapevines are usually cut back to one or two buds. If they make a very strong growth during the first season, this growth can be tied up to a stake to form the trunk of the vine. If the growth is rather weak during the first season, it is preferable to cut back at the end of the first growing season again to one or two buds and to train up a strong trunk during the second growing season.

If the vine is to be trained to a fence or a 2-wire system, as shown in figure 24, it should be

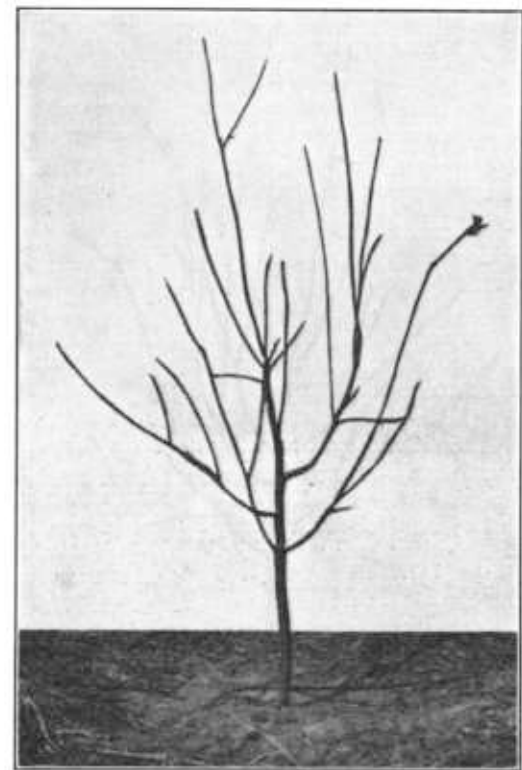


FIGURE 19.—The tree shown in figure 18 after it had been pruned.

tied to a stake and carried upright until it reaches the top wire. At that point it should be pinched off and two laterals led out, one in each direction, along the wire.

During the following season, lateral canes will grow from all the buds along the trunk. Two of these at the height of the first wire above the ground should be selected and tied to the wire to develop fruiting wood. The other branches along the trunk should be rubbed off or pinched back during the growing season.

After the vines attain this form, pruning will consist in saving one strong lateral and tying it along each wire each growing season. All other laterals will be removed except that short spurs should be left to grow the fruiting cane for the next season. This method of pruning is illustrated in figure 25.

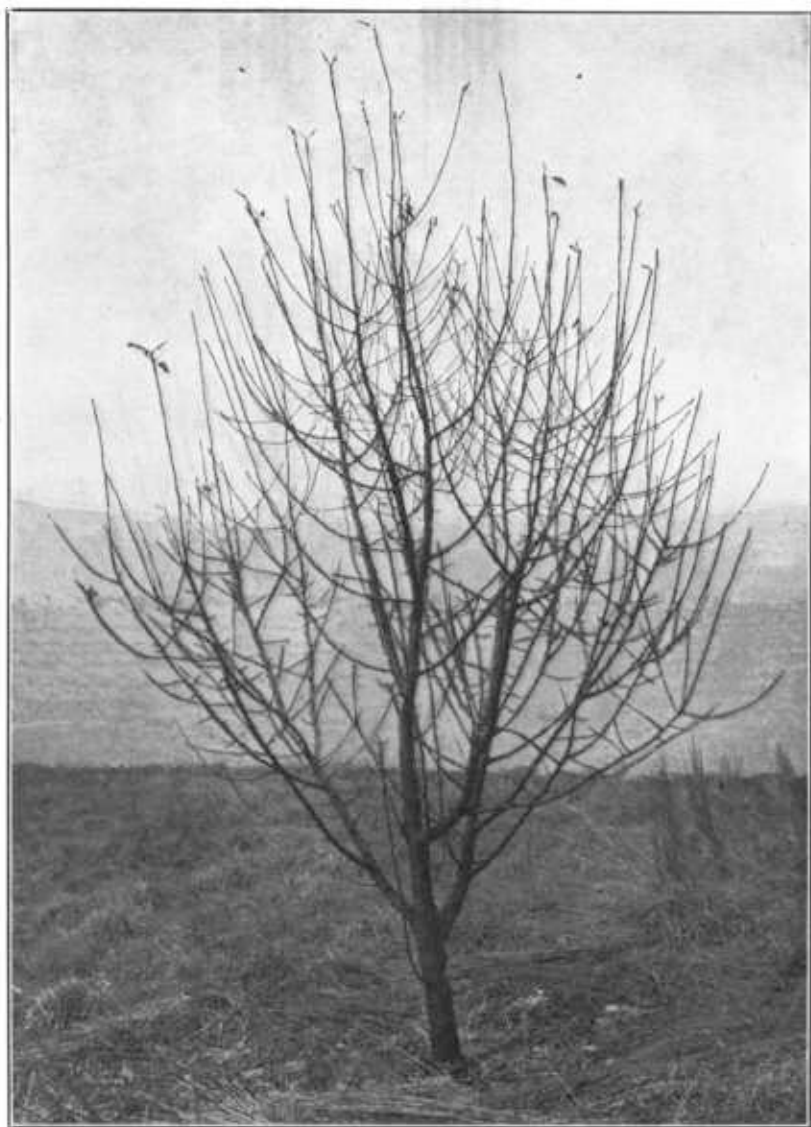


FIGURE 20.—A 4-year-old York Imperial apple tree before it was pruned.

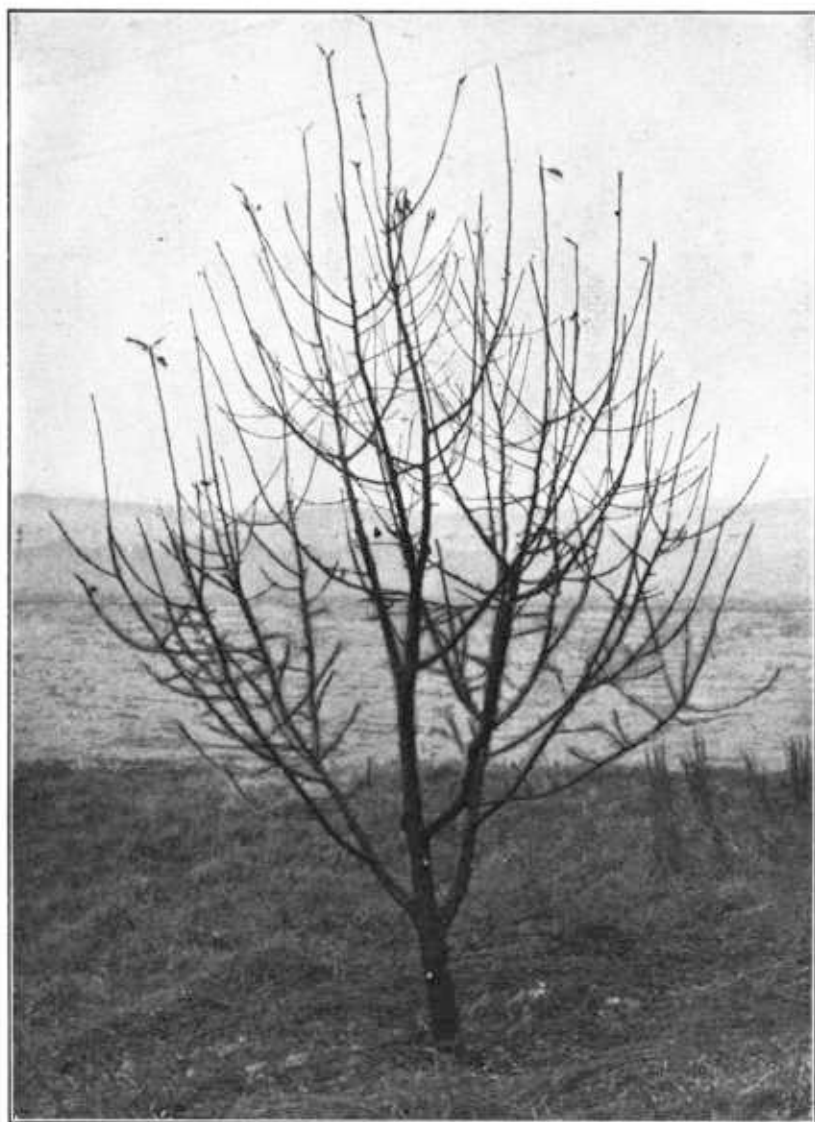


FIGURE 21.—The tree shown in figure 20 after it had been pruned.

More wood may be left on vines for home production, provided sufficient space is available for the vine to develop. With vigorous vines, the leaving of more wood would result in a greater total quantity of fruit, although the individual bunches may be inferior in size and quality. The type of pruning outlined is essentially that followed in most commercial vineyards in the United States, except in California, where vinifera varieties are largely grown.

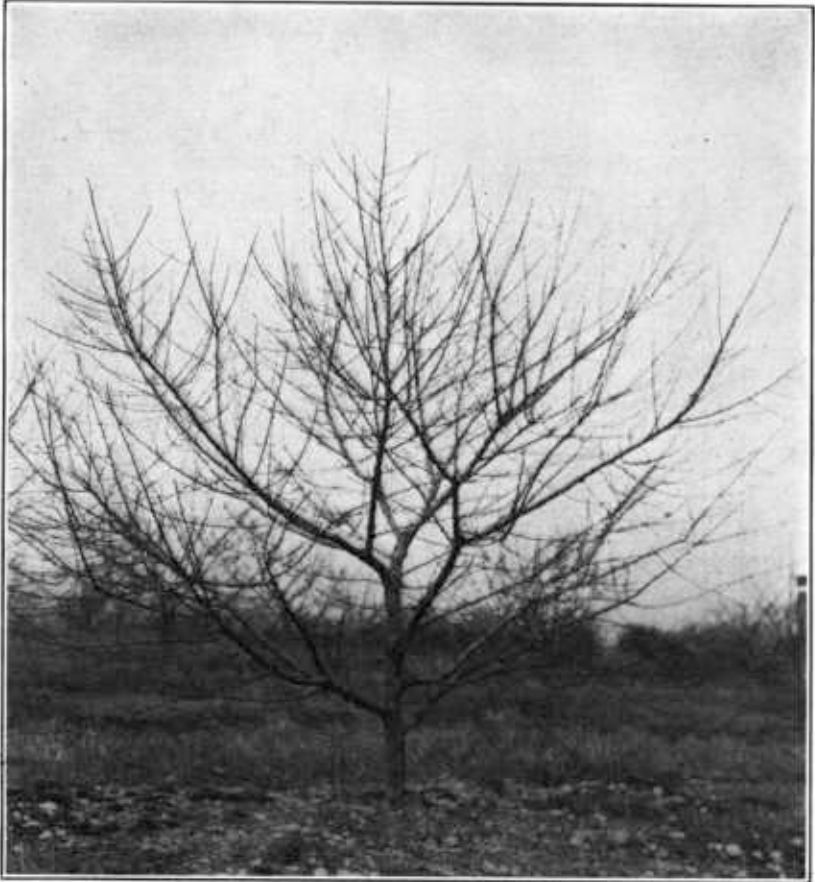


FIGURE 22.—A 4-year-old peach tree before it was pruned.

PRUNING RASPBERRY AND BLACKBERRY PLANTS

The pruning of raspberries and blackberries consists of removing the old fruiting wood each season. This wood may be removed immediately after the crop is harvested, or it may be left until the dormant season. In most parts of the United States it is preferable to remove the old wood immediately after fruit harvest, so as to prevent the crowding of the new canes by the old and to prevent the spread of disease from the old canes to the new ones. These old canes should be cut off close to the ground, and the new canes will then develop strong growth to produce fruit for the following season.

With raspberries, both black and red, it is frequently desirable to tie up the new canes, either between wires or to stakes, to support them off the ground. Blackberry and dewberry canes should also be tied up to stakes or to a trellis, but canes of all varieties of bramble fruits not completely hardy may be left on the ground, where they will have some snow cover, or else will be covered with soil until spring. They

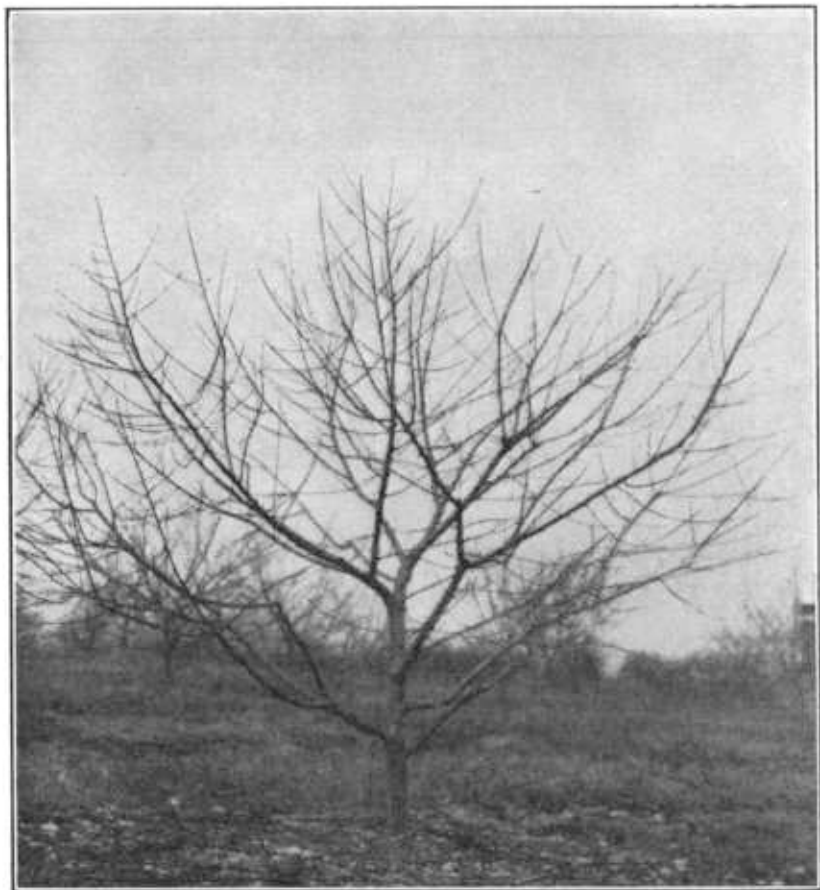


FIGURE 23.—The tree shown in figure 22 after it had been pruned.

should then be tied up to stakes or to a trellis prior to the starting of growth in the spring. If raspberries and blackberries make a very strong growth and develop a large number of canes, it is frequently desirable to thin out the number of canes to six or eight per hill during the dormant season.

It is generally desirable to cut off the tips of the young shoots of black raspberries when they reach a height of 18 to 24 inches. This induces branching and results in more satisfactory total production. Red raspberries and blackberries usually are not cut back during the growing season. If the red raspberry canes make a growth in excess of 5 feet, it is sometimes advantageous to tip them back to about that height in the spring prior to the starting of growth.

PRUNING GOOSEBERRY AND CURRANT BUSHES

Canes 2 and 3 years of age produce the most satisfactory gooseberries and currants. In general, the pruning of these fruits will be limited, during the first 2 years, to thinning out the bushes if more than 8 or 10 shoots have developed. After the planting is 3 or 4 years old, a systematic cutting out of the oldest wood each season is desirable leaving young shoots to replace this old wood. This should be done during the dormant season.

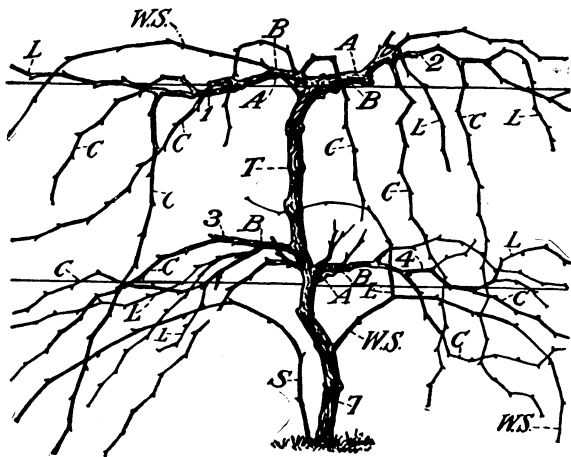


FIGURE 24.—Diagram of a grapevine before pruning, showing the different parts and illustrating the four-arm system of training: *A*, Arms or ramifications of the branches, usually of wood 2 or more years old; *B*, branches which are of mature wood several years old; *C*, canes, called shoots when green and canes when mature; *L*, laterals, the secondary shoots of a cane; *S*, suckers, the shoots starting below the ground from the main body; *T*, trunk, the stem or main body of the vine; *W. S.*, water sprouts, the shoots that start above the ground from wood more than 1 year old; *1, 2, 3, 4*, 2-year-old arms.

WOUNDS CAUSED BY PRUNING

The manner in which pruning wounds are made determines to a large extent the readiness with which they heal, or whether they never heal, but become danger spots from decay. A stub of any considerable length left in cutting

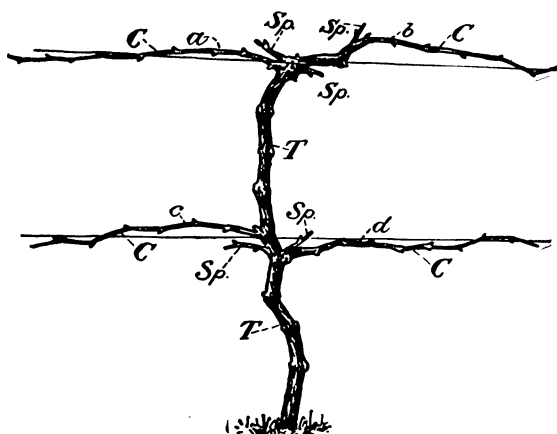


FIGURE 25.—A vine pruned according to the four-arm system: *C*, Canes, called shoots when green and canes when mature; *Sp.*, spurs, canes cut back to one to four eyes; *T*, trunk, the stem or main body of the vine; *a, b, c, d*, arms succeeding those shown at their 2-year-old stage in figure 24 at *1, 2, 3, 4*.

off a branch never heals. The stub dies, decays, and the decay may eventually result in a hollow-hearted tree. The wound made in cutting off a branch close to its supporting limb will ordinarily begin healing over at once, or as soon as the tree renews its growth if the pruning is done during the dormant season. The results of good and bad pruning are shown in figure 26. At *A* a stub was left. That it is not healing is apparent.

After such a stub dies, decay that will probably extend into the body of the tree is inevitable. The wound at *B* is healing, but if the limb had

been cut off at the line *b—b*, it would have been better. The other wounds shown represent limbs that were cut off close to the trunk and are healing properly.

TREATMENT OF PRUNING WOUNDS

Probably the most important treatment for pruning wounds, where any is needed, is to keep the exposed surface in an aseptic condition. If the wounds on a tree that is sprayed with a fungicide several times a year are thoroughly coated with the fungicide each time the tree is sprayed, the danger of infection from decay-causing organisms is much reduced, if not eliminated. Small wounds that will heal over within perhaps 2 or 3 years are not likely to need any other treatment.

There is, in fact, some question as to the advantage of applying any other than the fungicidal treatment to pruning wounds regardless of size. Some of the results of experimental work indicate that undressed pruning wounds have healed more rapidly than those that have been treated. It is possible, however, that some advantage may come in the long run from protecting the surfaces of large wounds. This would usually be in preventing the weathering of the surfaces and the resulting tracks that make easy lodging places for organisms causing decay.

Many substances have been tried and variously recommended, but none is fully satisfactory. Among these substances are white lead paint, shellac, water glass, grafting wax (either liquid or solid), a coal-tar creosote mixture, and others, including many proprietary preparations. Practically



FIGURE 26.—Wounds made in improper pruning. At A is a long stub which will never heal over. The wound at B is healing fairly well, but better results would have followed had the limb been cut off on the line *b—b*.

any covering employed will need to be renewed from time to time in order to be effective.

If white lead paint is used, it should not be applied to the outer rim of the wound where it will cover the cambium, which is located just underneath the bark. The healing will be retarded if that is done. Shellac may cause little or no injury, but rather frequent application seems necessary if the surfaces are to be kept well covered. Water glass at full strength or diluted, 75 percent of water glass and 25 percent of water by volume, gave promising results in experimental work carried out in Ohio on muscadine grapes and silver maple trees. These treatments appeared quite effective in pre-

venting bleeding. Grafting wax can be made at home from ingredients easily obtainable and therefore has the advantage of availability. The coal-tar creosote mixture consists of coal tar thinned with sufficient creosote (ordinary commercial grade) to make it easy to apply with a brush or swab. If about one-fourth to one-third of the volume consists of creosote, the mixture will have about the right consistency at ordinary temperatures. Heating the mixture may give it a better consistency in cold weather, but this must be done with much caution, as creosote is inflammable. In applying the mixture to a pruning wound, a rim or band around the edge which includes the exposed cambium must be left free of this mixture, as otherwise it will injure the cambium and retard the healing.

The bleeding of a pruning wound, that is, the flow of sap from it, which sometimes occurs, especially if the wound is made late in the spring, and often excites the owner's fear of harmful results, need cause no worry. It is comparable physiologically to the flow of sap when a sugar maple is tapped in sap time.

CONTROL OF DISEASES AND INSECTS IN HOME ORCHARDS²

The home orchard is subject to all the disease and insect troubles that occur in commercial orchards. Unless these are effectively controlled in the small home plantings, the owner will wonder why his fruit drops prematurely, why it is wormy, why it is so inferior or worthless. The effective control of most fruit diseases and insects involves three factors: (1) Spraying or dusting with the proper fungicides or insecticides, (2) timeliness of applications, and (3) thoroughness of applications. A fault in any one of these factors will largely, if not entirely, defeat the object of the control measures employed.

The following brief outline is intended to apply particularly to the humid part of the United States, that is, to the part east of the Rocky Mountains. Growers in the Intermountain and Pacific Coast States who need help in their fruit-disease and insect problems should seek the aid of their county agricultural agent or their State experiment station, agricultural college, or extension specialists. In fact, growers throughout the country should form the habit of consulting their State specialists. Local conditions largely determine the exact time when a control measure can be applied most effectively, and the local or State specialists can best supply such information.

DISEASES AND INSECT PESTS OF APPLES, PEARS, AND QUINCES

Most diseases and insect pests of the apple, pear, and quince, such as scab, fruit rots, the various leaf spots, the San Jose scale, the codling moth or apple worm, and caterpillars, can be largely controlled by spraying. Dusts may be used instead of sprays in all except the dormant or winter applications, and while not generally so effective during the growing season as the sprays, dusts are more easily and rapidly applied. The following schedule for control of the more

² By John W. Roberts, principal pathologist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, and B. A. Porter, senior entomologist, Division of Fruit Insect Investigations, Bureau of Entomology and Plant Quarantine.

serious diseases and insect pests is suggested for the home orchardist who cannot follow the detailed program recommended to the commercial grower:

(1) Lime-sulphur, 1 pint to 1 gallon of water, or 3-percent oil emulsion, to be applied before growth begins in the spring.

(2) Lime-sulphur, 1 pint, and lead arsenate, 15 level teaspoonfuls in 5 gallons of water, or a dust composed of dusting sulphur, 9 parts, and lead arsenate, 1 part by weight, to be applied (*a*) just before the blossoms open, (*b*) just after the petals have fallen, (*c*) 3 to 4 weeks later, and (*d*) 3 weeks later.

(3) Bordeaux mixture to which lead arsenate is added at the rate of 15 level teaspoonfuls to each 5 gallons of the mixture, or a dust composed of copper-lime,³ 9 parts, and lead arsenate, 1 part by weight, to be applied about July 1 on varieties ripening after August 15.

More detailed information may be found in Farmers' Bulletins 938, Apple Bitter Rot and Its Control; 1478, Apple Scab; and 1479, Apple Blotch.

Since these sprays and dusts are poisonous, all fruits treated with them should be thoroughly washed before being eaten or offered for sale. The same sprays and dusts may be used at the same time on sour cherries, but not on peaches, plums, and sweet cherries. The sprays and dusts here recommended for peaches and plums may also be used safely on apples, pears, and cherries; they will not control apple and pear pests as well as the lime-sulphur and oil sprays, but if one set of sprays is desired for all these fruits, that recommended for peaches and plums should be used. All rotten, wormy, and scabby fruit should be removed from the tree or from the ground and destroyed.

DISEASES AND INSECT PESTS OF PEACHES, PLUMS, AND CHERRIES

Certain diseases and insect pests of the peach, plum, and cherry, such as scab, rot, leaf curl, the San Jose scale, and the plum curculio or worm, can be controlled by spraying or dusting as follows:

(1) Spray with lime-sulphur, 1 pint to 1 gallon of water, before the buds begin to swell late in the winter, or in the fall after all the leaves have fallen. Dusts used at this time are not effective.

(2) Spray with wettable sulphur, one-half pound, lead arsenate, 15 level teaspoonfuls, and hydrated lime, 15 level teaspoonfuls, in 5 gallons of water; or dust with dusting sulphur, 9 parts, and lead arsenate, 1 part, (*a*) about 10 days after the petals have fallen or when the shucks have been shed by the young fruit, and (*b*) about 2 weeks later.

(3) Spray with one-half pound of wettable sulphur in 5 gallons of water, or dust with dusting sulphur about 2 to 4 weeks before the fruit is expected to ripen. No lead arsenate should be used in this application.

More detailed information may be found in Farmers' Bulletins 1053, Control of Cherry Leaf-Spot, and 1527, Peach Brown Rot and Scab.

³ Copper-lime dust is composed of copper sulphate monohydrate (20 percent) and hydrated lime (80 percent).

The sprays or dusts recommended under (2) contain a poison, but at the time of application the fruit is so small that very little poison is carried over to harvesttime. If, however, spray residue is in evidence when the fruit is ripe, it should be thoroughly cleaned before it is eaten or offered for sale.

The presence of a mass of gum and sawdustlike material at the base of the tree usually indicates the presence of the peach borer at or near the ground line. Peach trees are seriously weakened by the attack of this insect and in extreme cases may be killed outright. The borers may be controlled by carefully digging them out with a sharp knife or by applying a ring of paradichlorobenzene 1 to 2 inches from the tree at the rate of three-fourths to 1 ounce per tree and then covering it with several inches of closely packed soil. The treatment is most effective if applied during September or October, the date varying with the locality. More detailed information may be found in Farmers' Bulletin 1246, *The Peach Borer*.

SPRAY AND OTHER CONTROL MATERIALS

Spray materials may be purchased in small quantities from seedsmen, nurserymen, florists, and hardware and other dealers. Directions for use will usually be found on the package; also information as to the nature of the material, whether a lead arsenate, bordeaux mixture, wettable sulphur, etc.

Lead arsenate.—Lead arsenate is used for controlling leaf-eating and other chewing insects. It is purchased as a white powder and is deadly poisonous to man and animals as well as to insects. It is used at the rate of about 1 ounce (3 level tablespoonfuls) in 3 gallons, or 1 pound in 50 gallons of water. It is commonly sold under its own name or ready-mixed with one of the other sprays, such as bordeaux mixture or wettable sulphur, with which it is commonly used. *This poison should not be used except when the fruit is very small or where washing or brushing will remove all spray or dust residues.*

Bordeaux mixture.—Bordeaux mixture may be made at home or obtained ready made as a paste or dry powder. If the label on the package of a proprietary mixture states that the active ingredient is copper and that the material is for use on fruit trees, grapevines, potatoes, etc., the buyer may be fairly certain that the package contains bordeaux mixture. The strength at which the mixture should be used is indicated on the package.

For home-made bordeaux mixture, measure out the following materials:

	<i>Small quantities</i>	<i>Large quantities</i>
Pulverized bluestone (copper sulphate)-----	2 level tablespoonfuls.	3 pounds.
Water-----	2 quarts.	25 gallons.
Hydrated lime-----	5 level tablespoonfuls.	4 pounds.
Water-----	2 quarts.	25 gallons.

Dissolve the bluestone in the water in an earthen or wooden vessel (bluestone is corrosive to some metals, particularly iron); place the hydrated lime in the second portion of water and stir it; then pour the bluestone solution into the limewater while stirring, or, better still, pour the two simultaneously into the spray tank or container.

Lime-sulphur.—Lime-sulphur is a clear fluid, amber to cherry red in color. It is used in winter at the rate of 1 pint to 1 gallon of water, and during the growing season at the rate of 1 pint to 5 gallons of water. It is sometimes sold in the dry state. One-half pound of the dry material equals 1 pint of fluid.

Oils and emulsions.—Oil emulsions and miscible oils are sold under various trade names and can be identified by the labels. These oils and emulsions are useful in the control of scale insects, but should be applied only when the trees are wholly dormant.

Wettable sulphur.—Wettable sulphur is sold under trade names and can usually be identified by the word "sulphur" in the analysis given on the label, but it should not be confused with lime-sulphur, which is either a clear amber or reddish fluid or a powder that forms such a fluid when mixed with water. Wettable sulphur mixed with water forms a white to cream-colored or yellowish fluid. It should be used at the rate of about one-half pound to 5 gallons of water, or as directed on the package.

Sulphur dust.—Sulphur dust is a specially prepared, finely ground sulphur that may be bought by itself and mixed when needed with lead arsenate at the rate of 9 parts of sulphur to 1 part of lead arsenate, or the two may sometimes be bought ready-mixed.

Copper-lime dust.—Copper-lime dust may be used in place of the bordeaux mixture spray, but it is generally not so effective as the spray. It may be bought ready-mixed and with or without lead arsenate.

Paradichlorobenzene.—Paradichlorobenzene is a white crystalline substance somewhat similar to naphthalene. In purchasing paradichlorobenzene for the control of the peach borer, the growers should ask for the pure chemical, of the fineness of granulated sugar or in small flake crystals. This is used for peach borer control at the rate of three-fourths to 1 ounce per tree.

Nicotine.—Although not included in the regular spray programs outlined in this bulletin, nicotine is very useful in the control of aphids and certain other soft-bodied insects, which it kills by direct contact. Nicotine is available chiefly as a concentrated solution containing 40 percent of actual nicotine in the form of nicotine sulphate. This solution should be used at a strength of about 1 teaspoonful per gallon of spray, or 1 fluid ounce in 8 gallons, and should always be used with lime-sulphur or bordeaux mixture, or with an ounce of soap dissolved in each gallon of spray mixture.

IRRIGATION

In the semiarid sections of the Pacific coast and the Intermountain States of the West, where the precipitation which falls is mostly during the winter season, with rarely any rainfall of consequence during the growing season, irrigation is practically essential to the successful growing of fruit. In the Great Plains area, where some of the limited precipitation falls during the growing season, many of the tree fruits persist surprisingly after they once become established, but where water is available for irrigation, its use will aid the trees in the average season and help to insure the production of currants, gooseberries,

and other small fruits. Even in humid sections fruit growers who have installed an irrigating system often find that it pays well, since it gives them a means of averting losses which otherwise would be suffered in times of severe drought. This is true especially of strawberry and other small-fruit growers, though in some cases orchardists in humid sections have provided irrigation facilities for their orchards.

Several systems of applying irrigation water are in more or less common use. In one—the overhead-spray system—the water is distributed through pipes supported on posts placed at intervals through the area to be irrigated. The pipes are so perforated that when the water, which must be under some pressure, is turned into them, it is distributed over the entire surface that is to be covered.

By another system, the water is distributed through furrows usually 3 to 4 feet apart between the rows. This system requires a uniform surface that slopes gently from the source of the water supply; or if the surface is so broken or hilly that it cannot be leveled it will be necessary to make the furrows nearly parallel with the slopes.

Still another method, the basin system, is sometimes used and may be adapted to the home orchard in place of the other systems. This consists essentially in making a large basin about each tree either by excavating the soil somewhat or by mounding up a ridge of soil around the tree at some distance from it. The water is conveyed into the basin thus made through a pipe or in some other way.

While the overhead and furrow systems are used primarily in commercial activities, they can be adapted readily to the home orchard or fruit garden.

Further information in regard to irrigation may be obtained in other publications issued by the United States Department of Agriculture and by certain experiment stations and extension divisions of some of the agricultural colleges.

SELECTING VARIETIES OF FRUIT FOR PLANTING

A home orchard or fruit garden will prove either worth while or disappointing, depending largely on the choice of the kinds and varieties of fruit that it produces. The likes, dislikes, preferences, and needs of the family should govern, as far as possible, within the range of the adaptability of different varieties to the conditions and the facilities available for caring for the fruit produced. If, for instance, fruit such as peaches or plums is desired especially for canning, that fact should be considered in the planting plans; apple varieties may be selected that ripen during the summer or fall or do not reach maturity until winter—some weeks or months after they have been harvested. The grower may be located where fresh fruit can be purchased to better advantage at certain times than at others. If home production must be very limited, it would be sensible to plan so that the fruit grown would become available during those periods when purchased supplies cannot be so readily obtained. Again, long-keeping varieties of apples and pears would not be desirable in the absence of suitable facilities for storing them until they were ready or wanted for use. These and many other factors enter into the planning of a home orchard that will best meet family needs.

COMMENTS ON DIFFERENT FRUITS

APPLES

As nearly as it is practicable to do so, the varieties are named in the district lists (pp. 41 to 54) in their approximate order of ripening, and they are grouped into early, midseason, and late sorts. These terms are relative only, and the season of use of the different varieties in many instances overlaps. This is true especially of the midseason and late sorts. The period of use of a considerable proportion of those which are grouped as midseason varieties may extend into early winter, while the season of some of the varieties grouped as late will begin in the late fall. This grouping of the varieties is intended especially to help the grower whose plantings must be limited to a very few trees of sorts that ripen at preferred periods.

It should be noted that the Winesap and other varieties of the Winesap group are not only highly self-sterile but are worthless as pollinizers for other varieties. The Baldwin and Rhode Island Greening are but little better. In general, Delicious, McIntosh, Grimes Golden, Jonathan, Rome Beauty, and Yellow Transparent are effective pollinizers for most other varieties.

Many people, in making up lists of varieties to plant, and recalling their favorite apples of earlier days, will note the absence of many choice varieties that were widely planted when the home orchard was the dominant type of fruit growing. Many such varieties lacked qualities essential for a good commercial apple. As a result, in the development of commercial orcharding and the gradual disappearance of the one-time amateur grower, such varieties have dropped out of sight and have long since ceased to be propagated in the nurseries.

PEARS

While the home orchard is hardly complete without pears, the prevalence of pear blight and its destructiveness render their culture rather uncertain as to results. The lists for the different districts are made up of a few of the more dependable varieties. The Bartlett, one of the most extensively grown varieties, is effectively pollinated by Bosc, Clapp Favorite, Conference, Flemish Beauty, Howell, Kieffer, but not by Seckel; the Kieffer, by Flemish Beauty, Howell, Seckel, and fairly well by Bartlett; the Seckel, by Bosc, Flemish Beauty, Howell, Clapp Favorite, but not by Bartlett, and Kieffer is uncertain.

QUINCES

A single variety, the Orange, comprises the bulk of the quinces that are grown throughout most of the country. This fruit succeeds best in the northern districts.

The Rea and Champion are planted occasionally and ripen after the Orange. The Van Deman is sometimes reported from the South. The Pineapple variety should be planted in home gardens in the Pacific Coast States.

PEACHES

The varieties listed for the different districts represent the choicer sorts for their seasons and are named, so far as possible, in the order

in which they ripen. As a rule, the very early varieties are poor in dessert quality, and where only a small number of trees can be planted the grower will do well to choose some of the midseason or later varieties of better quality. In many instances, also, the very late varieties will be less desirable for home planting than the midseason sorts.

Peach varieties, as a rule, do not require cross-pollination. The most important exception is the J. H. Hale, which does not fruit satisfactorily unless planted with another variety. The Elberta or probably any of the commonly grown sorts is effective with it.

The characteristics other than time of ripening, which are usually of the most concern to the grower are the color of the flesh and the adhesion of the flesh to the stone. To supply this information in brief, certain letters appear in parentheses after each variety name, as follows: w=white flesh, y=yellow flesh, c=clingstone, f=freestone, fc=sometimes freestone and sometimes clingstone (or in some cases the variety is semicling, flesh separating from the stone with but little difficulty, yet not with perfect freedom).

NECTARINES

The nectarine is but little grown, relatively, in the United States, and only a very few varieties are of commercial importance. It is often described as a peach with the skin of a plum; it is, in fact, substantially a smooth-skinned peach, though the flavor is somewhat different. Nectarines originate as sports or mutations of the peach. The tree is practically indistinguishable from the peach tree. A single branch of a peach tree may represent such a mutation; peach pits occasionally give rise to nectarine trees. The plum curculio is likely to attack nectarines severely.

PLUMS

The plum varieties in cultivation represent three distinct types: The European or domestica (sometimes referred to as the "big blue plum"); the native (derived from native species); and the Japanese. A fourth type might also be recognized, consisting of varieties that have originated as hybrids between native and Japanese varieties. These usually possess characteristics of both parent types. Some of the most important commercial varieties grown on the Pacific coast, and to a limited extent elsewhere, belong to this hybrid group.

Nearly all plum varieties require cross-pollination. Native and Japanese varieties will usually effectively cross-pollinate one another where they blossom simultaneously, but neither type is effective for the European varieties, nor is the latter effective for the native and Japanese varieties.

CHERRIES

The number of varieties of cherries to be recommended for planting is small. In some of the lists the varieties named are grouped under Sour and Sweet. When no sweet varieties are named, it is to be understood that the planting of them is not advised in the districts to which the lists apply. Where only a single sour variety is desired, the Montmorency should usually be given the preference. The naming of other sour varieties is primarily for the purpose of extending the

cherry season. There is no serious self-sterility problem with sour cherries.

Sweet cherry varieties are largely sterile with their own pollen, and some of the varieties, unlike most other kinds of fruits in which self-sterility is common, are sterile with each other. In most of the districts in which both sweet and sour varieties are planted together, there appears to be little difficulty with regard to the satisfactory fruiting of the sweet varieties; but in districts 13 and 14 and in some parts of district 12, where sour cherries are rarely planted and in which the sweet cherry is of great importance, the trees frequently do not bear well, owing probably to self-sterility or to the sterility between different varieties.

It has been determined by the Oregon Agricultural Experiment Station that the Black Tartarian and Republican varieties will cross-fertilize most other sweet varieties.

APRICOTS

Apricots are listed for planting only in districts 12, 13, and 14. While apricot trees are widely distributed and will grow in most regions where peach trees thrive, they are not recommended for planting widely because of the uncertainty of the crop. The buds respond to the first warm days of early spring and start enough to become tender even if they do not open; they are often injured later by low temperatures that are not unseasonable. This is so likely to occur in most parts of the country that those who plant apricot trees should do so in full knowledge of what to expect.

So far as known, there is no self-sterility problem with apricots.

The Russian varieties such as Budd, Gibb, Stella, and Superb may be harder than other varieties and perhaps can be grown where the more tender varieties are injured by adverse temperatures too frequently to justify planting them. But the fruit of these Russian sorts is usually small, generally soft and of coarse texture, unattractive in appearance, and lacking in eating quality as compared with the commercial varieties of the Pacific coast.

JAPANESE PERSIMMONS

Japanese or oriental persimmons are quite widely, though not extensively, grown. In general they occur in the Coastal Plain region from Virginia southward, and more widely in the South Atlantic States, the Gulf States, and California.

While there are a considerable number of varieties, the Tanenashi, in the Southeastern States, and the Hachiya, in California, are the most important sorts. The Tanenashi develops to maturity without pollination. The pollination requirements of other varieties appear to vary with conditions. Some varieties develop a brownish color in the area occupied by seeds—the colored flesh being nonastringent. Only one known variety with light-colored flesh, the Fuyu, is nonastringent while still hard. Other varieties lose astringency under normal conditions only on softening.

FIGS

There are two types of figs—the Adriatic, which produces fruit without pollination, and the Smyrna, which must be pollinated. The process of pollination is referred to as caprification, because the pollen is produced by caprifigs, the fruit of which is practically inedible. Caprification is brought about by a particular insect, the *Blastophaga*, sometimes called the fig insect. There is only one variety of Smyrna fig of commercial importance in this country, the Lob Ingir. In California, where Smyrna figs are grown, this variety is generally known by the trade name “Calimyrna.”

Only figs of the Adriatic type are grown in the Southeastern States.

JUJUBES

Relatively few people are familiar with the jujube. While an occasional tree bearing small fruit of indifferent quality occurs throughout the South, it was not until after larger fruited varieties were introduced from China about 1908 that any real interest in their culture developed. C. C. Thomas, in United States Department of Agriculture Department Bulletin 1215, The Chinese Jujube, says of the range of adaptability:

The jujube grows vigorously in hot climates and reaches its best development when the weather is dry, the sunshine brilliant, the nights warm, and the summers long and hot. The southwestern section of the United States, with the exception of the elevated portions where the summer nights are too cool, and limited areas, such as coastal regions, where the humidity may retard fruit production, is well adapted to jujube culture. The drier sections of some of the Southern States have produced some excellent fruit.

RASPBERRIES

There are three types of raspberries in common cultivation. These types are usually designated by color (red, black or blackcap, and purple or purplecane), not only for convenience but because the color factor is coordinated with certain type characteristics. The purple raspberries are hybrids between the other two types and possess characteristics that are to a considerable extent intermediate between them. The color terms refer primarily to the color of the fruit.

BLACKBERRIES

The blackberry in its various varieties and types is a widely distributed fruit, though of relatively minor importance commercially. The Lucretia dewberry, considerable quantities of which are grown, is usually marketed under the designation, blackberry.

DEWBERRIES

Of the few varieties of dewberries grown, the Lucretia is by far the most important. The Young, commonly known as the Youngberry, is properly classed as a dewberry. It has become an important variety and is extensively grown in some sections, especially in the South and on the Pacific coast. In general, it is not sufficiently hardy for planting north of the Potomac River.

CURRANTS AND GOOSEBERRIES

Currants and gooseberries are sufficiently closely related, at least in habits of growth, cultural requirements, and in other ways, to be considered together.

There are two distinct types of currants, the common garden or red currant and the black currant, the latter never extensively grown in this country. Of gooseberries, the native varieties are the more widely grown, but the English varieties, representing a different botanical species and producing larger fruit, more desirable for eating in the fresh state than the native sorts, are grown to a limited extent in some of the more favorable sections.

Attention must be directed to the restrictions that exist in many States and regions against planting currants and gooseberries of any variety, on account of their relation to white-pine blister rust, a very destructive disease of the white pine and all other five-needle pines. One stage in the cycle of this disease occurs on the leaves of currants and gooseberries. In the absence of all such plants the disease is not perpetuated, hence the pines susceptible to it are protected. In many sections where the pine is important efforts to eradicate all *Ribes* (currants and gooseberries) are under way as a means of saving the more valuable timber trees.

Before planting either of these fruits, the grower should assure himself that to do so would not be in conflict with any quarantine regulations. This information can be obtained from State sources such as the State department of agriculture or the agricultural experiment stations, or from the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

STRAWBERRIES

Strawberry varieties are classed as perfect or imperfect, according to whether the varieties have both pistils and stamens or pistils only. The imperfect-flowered varieties should be planted with perfect-flowered ones, usually two rows of the former alternating with one row of the latter. All varieties named in the various district lists on later pages are perfect-flowered. One or more of the so-called ever-bearing varieties is included in many of the district lists. This type of strawberry does not do well in southern locations.

GRAPES

Grape growing is represented by three distinct types: The native bunch grapes, of which the Concord is the best-known variety; the muscadine grapes, of which the Scuppernong is the most familiar sort, and which are native to the Coastal Plain region of the South Atlantic and Gulf States; and the vinifera, or European grapes, the basis of the grape industry of California and a portion of that in other Western States. Grapes are frequently grouped also for convenience by color: white, red, and blue (or black). In the district lists the blue and black varieties are grouped together under the word "black."

There are some rather serious self-sterility problems connected with grapes, though among the native bunch varieties many of the more commonly planted sorts are self-fertile. The muscadine grapes have staminate and pistillate vines. All fruiting varieties are pistillate and must be fertilized by pollen from the male or staminate vines to be productive. Under natural conditions there appears to be an abundance of wild staminate vines producing sufficient effective pollen to insure crop production. In a vineyard, especially if it is isolated from vines growing in the wild, staminate vines should be planted to insure abundant fruitfulness—having every third vine in every third row a staminate vine is common practice.

SELF-STERILITY, OR SELF-UNFRUITFULNESS OF VARIETIES

The fact that very many varieties of most kinds of deciduous fruit are sterile or unfruitful with their own pollen needs to be considered in selecting varieties to plant. This means, for example, that if a single tree of a Delicious or Winesap apple is planted where it is so isolated from a tree of some other apple variety that insects, principally the common honeybee, will not frequently pass from it to the Delicious or Winesap tree during the blossoming period, thereby pollinating the blossoms, the latter will not set fruit. The remedy for this is to plant trees of two or more varieties near one another; or, on a restricted scale, a single branch of a tree can be grafted to a "pollinizer variety."

A large amount of research work has been carried on by several of the State experiment stations to determine the pollination affinities and requirements of different varieties. It is usually sufficient to plant a self-sterile or self-unfruitful variety with another variety of the same fruit which blossoms at the same time, or with a considerable overlapping of the blossoming periods of the varieties, but there are some marked exceptions to this rule. Some of these are mentioned in the discussions of the various fruits in the following pages.

To insure adequate cross-pollination in a large block of a single variety, every third tree in every third row should be a pollinizer variety. A smaller proportion of the latter is sometimes used, but reduced fruitfulness is likely to result.

BUD SPORTS

Attention should be called to the varieties, especially of apples, that have originated as bud sports. Most, if not all, apple varieties that have been introduced to the trade which have so originated are strains that are more highly colored than the parent variety, or which develop a solid red color instead of striping. In many cases the bud sport develops high color before the parent variety attains its full color.

The apple varieties that have given rise to the more important bud sports and some of the names of the sports in the trade are as follows:

Delicious.—Starking, Richared, Shotwell Delicious, Harrison Red Delicious.
Oldenburg.—Red Duchess.

Rome Beauty.—Red Rome (perhaps several strains under the same designation). Seeando Red Rome, Galla Beauty (which may not be a sport but is an apple definitely of the Rome Beauty type and is preferred by some to that variety).

Stayman Winesap.—Staymared, Scarlet Staymared, Blaxtayman.

York Imperial.—Yorking, Colora York.

Gravenstein.—Banks, Red Gravenstein, and several others.

Jonathan.—Blackjon, Jonared.

McIntosh.—Blackmack.

Northern Spy.—Red Spy.

Winesap.—Seeando Winesap.

There are also others, but the above-named are some of the better-known apple sports that have been named and propagated for the trade.

Peach, plum, and other fruit trees have developed sports, but not as many have attracted attention as in case of the apple.

A number of yellow-fleshed clingstone peach sports promising for canning are under observation.

There are also many citrus bud sports. Some of them are superior to the parent variety, but a large proportion of the known citrus, and especially orange, bud sports represent offtype or other undesirable developments.

While it does not necessarily follow in all cases, the red or earlier-coloring apple sports are generally considered as differing from their parent varieties mainly in color and are usually considered to be adapted to the same conditions as the parent varieties.

AGE OF BEARING

Not infrequently inexperienced fruit growers expect fruit from their trees much sooner after planting than they should, and disappointment is then inevitable. The statements that follow concerning the age at which different fruits bear will serve as a general guide. The age of a tree is usually reckoned from the time it is planted in its permanent place.

Apple trees should begin to bear, as a rule, when they have been planted 6 to 8 years. Certain varieties, as the Yellow Transparent and Wagener, may bear considerably sooner, and others, such as the Northern Spy and Yellow Newtown, not until somewhat later. Individual trees of the same variety vary somewhat in this respect.

Pear trees, in general, bear at about the same age as apple trees, though perhaps when a little younger.

Quinces are usually 5 or 6 years old before they bear much fruit.

Peach and nectarine trees under favorable conditions may bear at 3 years of age, and in any event they should bear at 4 years of age unless they have been injured by frost or in some other way.

Plums vary considerably according to the group to which they belong, but most sorts begin to bear 4 or 5 years after they are planted.

Sour cherries ordinarily begin to bear about 4 years and sweet cherries 6 or 7 years after planting.

Apricots come into bearing at about the same age as peaches or a little later.

Japanese or oriental persimmon trees come into bearing at 3 or 4 years of age under favorable conditions.

Fig trees will sometimes bear in the nursery, but by the time they are 2 or 3 years old considerable fruit is often produced. Some varieties, however, are less precocious than others.

Raspberries, blackberries, and dewberries, if planted in the spring, should bear a light crop the next year. Strawberries planted in the spring or early enough in the autumn to make a good growth before cold weather should produce a good crop the next season.

Currants and gooseberries commonly bear a few fruits the third season after planting.

Grapes may bear very lightly the third season where conditions are favorable, but not much fruit should be expected earlier than the fourth year.

THE FRUIT DISTRICTS

Fruit varieties differ greatly in their adaptability to conditions in different parts of the country. Doubtless the most potent factor in the behavior of varieties is temperature, although moisture and disease conditions are vital influences in many cases. Temperature is affected by latitude, elevation, and topography, including nearness to lakes and other large bodies of water and natural barriers such as mountain ranges, and even minor inequalities in the surface which constitute drainage channels or pockets for cold air as it settles to the lower levels. Temperature depends also on other conditions of location affecting length of day and intensity of sunshine in their relation to the accumulation of heat units.

Such factors as these can be outlined only very imperfectly on a map which attempts to show the country divided into different districts, each representing an area in which the conditions are somewhat uniform. However, there appears to be no better means of indicating in a practicable way the adaptability of a large number of varieties to different regions.

The map in figure 27 shows the United States divided into the districts to which the variety lists on pages 41 to 54 apply.

The lines on the map, which appear to indicate sharp and definite boundaries for the various districts, are, of course, arbitrarily placed. As a matter of fact there is a constant gradation from one district to another. The only marked exceptions are local, as where a few hundred feet up or down a mountain slope brings one into different temperature zones in which there are well-defined differences in the behavior of the same variety, or where large bodies of water modify the climatic conditions in a narrow belt along their shores, so that many fruits can be grown, which do not succeed farther inland. Sharply defined soil differences, especially subsoil and drainage differences, also constitute exceptions.

COMMENTS ON FRUIT LISTS

On pages 41 to 54, lists are given of fruit varieties that are suitable for planting in the different districts into which the country has been divided (fig. 27). These lists are suggestive only, but, as far as possible, they are made up of varieties believed to have merit for

home use in the different sections of the country. Incidentally, most of the commercially important varieties are included. In some of the districts other varieties might succeed, but too many from which to choose tends to confuse the inexperienced grower. Occasionally some of the newer or less known but promising varieties are included for trial.

It is not to be presumed that any one planter will wish to grow more than a small part of the varieties included in the list for his district, but the list will serve as a basis for making selections, even though it is not followed closely.

It should further be understood that not all the varieties in any list can be expected to do equally well throughout the district for which they are listed. The districts are large, and obviously con-

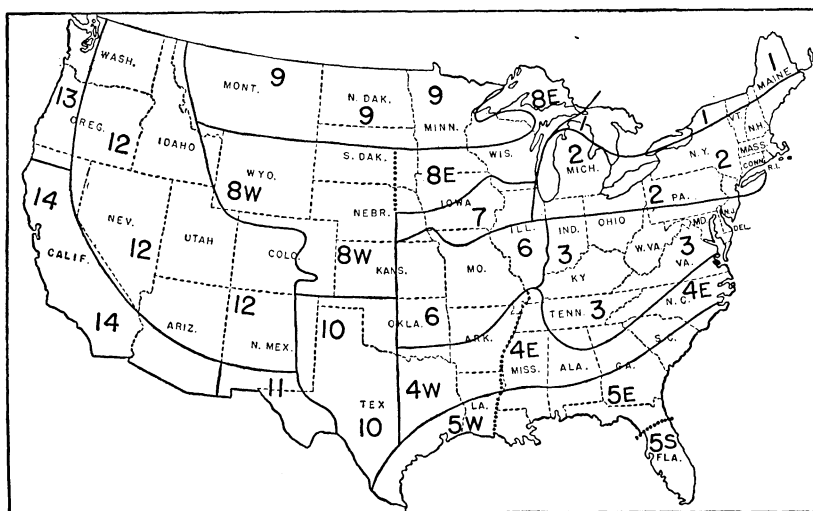


FIGURE 27.—Map of the United States, showing the districts into which the country is divided for use in applying the fruit-variety lists.

ditions that affect the behavior of varieties vary widely in different sections.

It will be observed that in the various district lists some kinds of fruit are not recommended for planting in particular districts and that some varieties of some kinds of fruit appear in most of the lists, while other varieties have a much more restricted distribution. The lists are grouped, as far as possible, on the known adaptability of the varieties to the conditions that characterize the different sections of the country. The climate, particularly the temperature, determines the response of a variety to its environment more than any other factor.

Information in regard to the characteristics of varieties may be obtained from standard works on pomology; from bulletins of the State experiment stations, agricultural colleges and their extension divisions, and the United States Department of Agriculture; and from experienced fruit growers.

DESCRIPTION OF THE DISTRICTS AND THE VARIETIES SUGGESTED FOR EACH ⁴

For an explanation of the abbreviations used in connection with peaches, see under "Peach varieties" (p. 33); under strawberries the abbreviation *imp.*=imperfect flowers. A synonym is shown by printing the name in italic type in parentheses.

DISTRICT 1

District 1 includes the colder portions of New England and New York and the northern part of the lower peninsula of Michigan. Because of the low winter temperatures, only very hardy varieties should be planted. In the more extreme portions some of the varieties suggested for this district may not be entirely hardy.

VARIETIES SUGGESTED FOR DISTRICT 1

Apples.—*Early*: Yellow Transparent, Red Astrachan, Oldenburg (*Duchess*). *Midseason*: Wealthy, Dudley, Fameuse (*Snow*). *Late*: McIntosh, Haralson, Scott Winter, Tolman Sweet.

Pears.—(In milder sections only) Flemish Beauty, Clapp Favorite. Varieties in district 8 suggested for trial planting.

Peaches.—While the planting of peaches in district 1 is not advised, the Polly (w f), which originated at Glenwood, Iowa, from a pit from the Iowa Agricultural Experiment Station; the Marquette (w f), which originated at Marquette, in the Northern Peninsula of Michigan; and Miss South Dakota (w f), which originated at Yankton, S. Dak., are probably more cold resistant than most other varieties. If experimental planting is attempted, these varieties might be tested.

Plums.—Arctic (*Moore Arctic*), Desoto, Surprise, Underwood, Superior.

Cherries.—Early Richmond; Montmorency.

Raspberries.—*Red*: Chief; Newburgh. *Purple*: Potomac.

Blackberries.—Snyder; Alfred.

Dewberries.—Planting not advised.

Currants.⁵—*Red*: Perfection; Red Lake. *White*: White Imperial.

Gooseberries.⁵—Poorman.

Strawberries.—Dunlap; Rockhill; Progressive (everbearing).

Grapes.—Alpha, Beta, Dakota, Janesville, and possibly a few others among the hardiest varieties. Only such sorts should be planted, if any.

DISTRICT 2

District 2 includes what is commonly termed the "northern fruit district." It contains many of the older apple orchards in the country. The area is large, and conditions vary considerably within its boundaries. Various adaptations should be indicated, especially with respect to peaches. While peach trees occur throughout a large part of this district, there are certain sections or belts in which the peach is of large commercial importance. These belts include western Michigan, bordering Lake Michigan; the portions of Ohio, Pennsylvania, and New York bordering Lake Erie and Lake Ontario; the "Finger Lake" section in central-western New York; some parts of the Hudson Valley; and certain restricted areas in southern New England. While grapes are widely grown in this district, they are

⁴The variety lists for the different districts have been compiled from many sources. F. P. Cullinan and George M. Darrow, of the Division of Fruit and Vegetable Crops and Diseases, supplied, respectively, most of the peach and berry lists; a considerable number of experiment station and agricultural college fruit specialists have given assistance; and the fruit lists in experiment station and extension publications and in horticultural journals and other papers have been freely consulted.

⁵See statement, p. 36, regarding restrictions on planting.

more dependable, in general, in the sections best adapted to peaches than elsewhere.

VARIETIES SUGGESTED FOR DISTRICT 2

Apples.—*Early*: Yellow Transparent, Lodi, Red Astrachan, Early McIntosh, Melba, Oldenburg (*Duchess*), Williams, Golden Sweet, Summer Pearmain, *Midseason*: Milton, Wealthy, Fall Pippin, Twenty Ounce, Fameuse (*Snow*). *Late*: McIntosh, Cortland, Tolman Sweet, Rhode Island Greening, Delicious (see Bud Sports, p. 37), Golden Delicious, Kendall, Baldwin, Red Canada, Northern Spy.

Crab apples.—Transcendent, Dolgo, Young America, Hyslop. Alexis, which is very similar to Dolgo, is recommended as a pollinizer for that variety.

Pears.—Wilder Early, Elizabeth, Bartlett, Seckel, Conference, Gorham, Bosc, Kieffer, Winter Nelis.

Peaches.—Arp (y c), Oriole (y f), Golden Jubilee (y f), Rochester (y f), South Haven (y f), Valiant (y f), Elberta (y f); in western part only—Halehaven (y f), Fertile Hale (y f); in southern part only—Wilma (y f), Salberta (y f c).

Nectarines.—Sure Crop, Hunter, Quetta.

Plums.—*Japanese varieties*: Beauty, Abundance, Burbank. *European or domestic varieties*: Clyman, Bradshaw, Lombard, Grand Duke, Stanley, Hall, Italian Prune, Reine Claude (*Green Gage*), Imperial Epineuse, Albion, Shropshire (damson), French (damson).

Cherries.—*Sour*: Early Richmond, Montmorency, English Morello. *Sweet*: Black Tartarian, Wood (*Governor Wood*), Yellow Spanish, Schmidt, Windsor.

Raspberries.—*Red*: June, Chief, Viking, Newburgh, Taylor, Latham, Cuthbert. *Black*: Plum Farmer, Cumberland, Naples. *Purple*: Potomac, Sodus.

Blackberries.—Eldorado (except along northern border of the district in New England), Snyder, Alfred.

Dewberry.—Lucetia.

Currants.^a—*Red*: Perfection, Red Lake. *White*: White Imperial.

Gooseberries.^a—Poorman.

Strawberries.—*Early*: Howard 17, Dorsett, Fairfax. *Late*: William Belt, Chesapeake, Catskill. *Everbearing*: Mastodon, Gem, Rockhill.

Grapes.—*White*: Portland, Ontario, Niagara, Golden Muscat (southern part). *Red*: Delaware, Goff, Catawba, Urbana. *Black*: Fredonia, Worden, Concord, Sheridan.

DISTRICT 3

District 3 includes the Cumberland-Shenandoah Valley area, the Piedmont section of Virginia, the Carolinas, and other areas of important commercial production of various fruits. Since it embraces practically all of the Appalachian Mountain system, with altitudes ranging from the highest east of the Rocky Mountains to practically sea level, there is an extremely wide range of climatic conditions. However, with the exception of those grown at the highest altitudes at which fruit can be grown in this district, the varieties recommended for the different sections of the district are similar.

VARIETIES SUGGESTED FOR DISTRICT 3

Apples.—*Early*: Yellow Transparent, Red Astrachan, Red June, Starr, Melba, Oldenburg (*Duchess*), Williams, Wilson June, Summer Rambo, Wealthy. *Midseason*: Smokehouse, Delicious, Jonathan, Grimes Golden, Winter Paradise (sweet), Kinnard. *Late*: Golden Delicious, York Imperial, Rome Beauty (p. 38), Turley, Stayman Winesap (p. 38), Winesap, Lowry. In southern part—Yates, Terry. At the higher elevations in southern Pennsylvania, some of the varieties characteristic of district 2 may be grown.

Crab apples.—Transcendent, Hyslop, Dolgo, and Young America for trial (see district 2).

^a See statement, p. 36, for restrictions on planting.

Pears.—In northern part of district, most of the varieties suggested for district 2 may be planted. In southern part—Seckel, Kieffer, and other varieties having appreciable resistance to blight should be planted, if any.

Peaches.—Mayflower (w c), Arp (y c), Marigold (y f c), Oriole (y f), Golden Jubilee (y f), Cumberland (w f), Rochester (y f), South Haven (y f), Eclipse (y f), Belle (w f), J. H. Hale (y f), Elberta (y f), Augbert (y f), Salberta (y f).

Plums.—*Japanese varieties:* Beauty, Red June, Abundance, Burbank. *European or domestica varieties,* especially for northern section and higher elevations of district: Bradshaw, Stanley, Italian Prune, German Prune, Imperial Epineuse, Archduke, Grand Duke, Reine Claude (*Green Gage*), French (damson), Shropshire (damson). Native and hybrid varieties, more especially for southern part of district: America, Methley, Wild Goose, Winesap.

Cherries.—Same as for district 2, but with decreasing value southward.

Japanese persimmons.—Planting not generally advisable, but have been grown with some success in southern Maryland and in Cumberland Valley in eastern Tennessee. Yemon and Hachiya have succeeded in Tennessee. The Gailey should be planted with these varieties to insure pollination. The Tanenashi will bear fruit without pollination.

Raspberries.—*Red:* Chief, Latham, Ranere (*St. Regis*) (fall fruiting). *Black:* Cumberland, New Logan. *Purple:* Potomac.

Blackberries.—Eldorado, Evergreen (in New Jersey only), Brainerd (southern part).

Dewberries.—Lucretia, Young (*Youngberry*) (southern part only).

Currants.⁷—(Northern part only) *Red:* Perfection, Red Lake. *White:* White Imperial.

Gooseberries.⁷—(Northern part only) Downing, Poorman; Glendale (southern part).

Strawberries.—Blakemore (southern part), Dorsett, Fairfax, Catskill, Chesapeake.

Grapes.—*White:* Ontario, Portland, Niagara (southern part), Hidalgo, Rommel, Wapanuka. *Red:* Brilliant, Catawba, Delaware, Goff. *Black:* Fredonia, Campbell Early, Concord, Worden; for southern part—Carman, Cynthiana, Hernito, Herbemont.

DISTRICT 4

District 4 includes the Coastal Plain and Piedmont areas in several States, the southern extension of the Appalachian Mountain area, a portion of the Mississippi Valley area, and a considerable portion of eastern Texas. The soil varies widely. The climatic conditions are those of the South, rather than of the North, in contrast to the transitional conditions in district 3. Some of the fruits grown in the more northern districts are not recommended for this district, while certain fruits that cannot be grown successfully in the North appear in these lists. Because of the differences in conditions in different parts of this district there are advantages in dividing it into eastern and western sections and giving the varieties for each section separately.

VARIETIES SUGGESTED FOR DISTRICT 4

EAST

Apples.—*Early:* Yellow Transparent, Lodi, Red June, Early Harvest, Red Astrachan, San Jacinto. *Midseason:* Bonum, Kinnard. *Late:* Delicious (p. 37), Stayman Winesap (p. 38), Golden Delicious, Winesap, Yates, Terry.

Pears.—Kieffer with Le Conte or Garber as pollinizers, Douglas.

Peaches.—Mayflower (w c), Arp (y c), Early Wheeler (*Red Bird*) (w c), Early Rose (w c), Hilcy (w f), Belle (w f), J. H. Hale (y f), Elberta (y f).

Plums.—Japanese, native, and hybrid varieties, same as for district 3. European varieties for district 3 should be omitted in this district.

Cherries.—Planting not advised.

Japanese persimmons.—See district 5.

Figs.—See district 5.

⁷ See statement, p. 36, for restrictions on planting.

Raspberries.—*Red*: Ranere (*St. Regis*) (above 500 feet altitude), Van Fleet.
 Dewberry.—Young (*Youngberry*).
 Strawberries.—Blakemore, Southland; northern part—Dorsett, Fairfax.
 Currants and gooseberries.—Planting not advised.
 Grapes.—*White*: Portland, Elvira, Niagara. *Red*: Agawam, Brilliant, Delaware. *Black*: Fredonia, Carman, Lenoir, Hubbard, Beacon. Along the Atlantic coast and for about 100 miles inland the varieties of the muscadine group of grapes also succeed. These include Thomas, James, Eden, Flowers, Mish, and Scuppernong.

WEST

Apples.—Yellow Transparent, Red June, Early Harvest, Helm, Bledsoe, Texas Red, King David, Delicious. In this district these varieties are all relatively early; even the later sorts ripen by September.

Pears.—Kieffer, Garber, Le Conte, Douglas.

Peaches.—Early Wheeler (w c), Early Rose (w c), Mamie Ross (w c f), Carman (w c f), Tena (y f), Dr. Burton (w f), Elberta (y f), Barbara (y c), Frank (y c), Augbert (y f), Fair Beauty (y f c) not advised for planting south of Arkansas; ripens 20 to 30 days before Elberta.

Plums.—Six Weeks, Advance, Bruce, Burbank, America, Nona, Golden (*Gold*), Waneta, Hanska.

Sand cherry-plum hybrids.—Opata, Sapa, Compass.

Cherries.—Planting not advised.

Figs.—Celeste, Ischia, Texas Everbearing, Brown Turkey, Ramsey.

Persimmons.—Tanenashi, Eureka, Hachiya, Yemon, Hyakume.

Raspberry.—*Red*: Van Fleet.

Blackberries.—Early Harvest, McDonald, Lawton, Dallas, Haupt. The McDonald is self-sterile; either Dallas or Haupt may be used as a cross pollinizer.

Dewberries.—Mayes (*Austin Mayes*), Young (*Youngberry*).

Strawberries.—Klondike, Blakemore, Southland, Dorsett (northern part).

Grapes.—*White*: Niagara. *Red*: Brilliant. *Black*: Moore Early, Carman, Beacon, Herbemont.

DISTRICT 5

District 5 consists largely of the Coastal Plain area. The elevation is low, the summers long, and the winters mild. Apples, cherries, and some other fruits are not adapted to the conditions, primarily the temperatures, that prevail here. Such fruits require a period of dormancy and rest induced by low winter temperatures. Even peach trees (excepting varieties of the Peento and South China races), which are planted more or less extensively in some parts of this district, are subject to prolonged dormancy rather frequently. This is the term applied to the failure of the trees to start into growth and to blossom in a normal manner in the spring following a winter so mild that there has not been a sufficient accumulation of adequately low temperatures to induce complete dormancy of the trees, and therefore they do not have the rest period requisite for normal behavior.

This district also includes the subtropical portion of Florida and the lower Rio Grande Valley in the extreme southern part of Texas, where citrus fruits predominate in the fruit industry, and also those areas in northern Florida and the Gulf coast sections of Alabama, Mississippi, and Louisiana, where the hardy Satsuma varieties of oranges are grown. In Florida, round oranges, grapefruit, and other fruits requiring a subtropical climate are grown from Flagler and Marion Counties southward. Few of these fruits are found north of Palatka and Ocala; furthermore, south of these points few deciduous fruits are found. Oranges and grapefruit are grown extensively in the lower Rio Grande Valley in southern Texas, oranges in the Delta section in Louisiana south of New Orleans, and the Satsuma type of orange in the western Panhandle section of Florida and the Gulf coast section of Alabama, Mississippi, and Louisiana.

VARIETIES SUGGESTED FOR DISTRICT 5

Apples.—Planting not advised.

Pears.—Kieffer, with Le Conte or Garber as pollinizers, and other oriental pear hybrids.

Peaches.—Varieties of the Peento and South China races—Jewel (y f), Honey (w f), Pallas (w f), Waldo (w f), Angel (w f), Hall Yellow (y f), Leona (y f); Hiley (w f) (in the northern part).

Plums.—Six Weeks, Excelsior, Terrell, Omaha, Methley, America, Poole Pride, Munson. *Japanese varieties*: Red June, Abundance, Burbank, Kelsey.

Cherries.—Planting not advised.

Japanese persimmons.⁸—Tanenashi, Hachiya, Hyakume, Okame, Triumph, Tamopan, Eureka, Zenji, Fuyu, Costata, Ormond, Gailey.⁹

Figs.—Celeste,¹⁰ Brown Turkey,¹⁰ Brunswick, Ischia, Lemon, Magnolia.¹¹

Pomegranates.—Purple Seeded, Rhoda, Sweet, Wonderful.

Jujubes.—Many varieties have been tested, but four which seem to possess all the desirable characters are: Mu Shing Hong, Lang, Sui Men, and Li.

Grapes.—*White*: Portland, Wapanuka, Hidalgo, Niagara. *Red*: Ellen Scott, Last Rose, Delaware, Valhalla. *Black*: Fredonia, Beacon, Cloeta, Carman. The varieties of the muscadine group named under district 4, east, are also adapted to most parts of district 5. By adopting special methods of training and by grafting on resistant stocks, certain varieties of vinifera or European grapes have been grown with some success. However, they are not recommended for general planting in this district.

EAST

Raspberry.—*Red*: Van Fleet (south to central Florida).

Blackberry.—Florida Marvel (in Florida).

Dewberries.—Young (*Youngberry*).

Currants and gooseberries.—Planting not advised.

Strawberries.—Blakemore, Southland (south to Florida), Missionary, Klondike (in Florida).

WEST

Raspberry.—*Red*: Van Fleet.

Blackberries.—McDonald, Lawton, Dallas (may be used to cross-pollinate McDonald, which is self-sterile).

Dewberries.—Young (*Youngberry*), Mayes (*Austin Mayes*).

Currants and gooseberries.—Planting not advised.

Strawberries.—Missionary, Klondike, Southland.

FRUITS FOR CENTRAL AND SOUTHERN FLORIDA AND OTHER SUBTROPICAL PARTS OF DISTRICT 5

Oranges.—(In Florida) Parson Brown, Hamlin, Pineapple, Valencia, Dancy (tangerine). Blood oranges sometimes grown are: Ruby, Malfese, St. Michael. Satsuma oranges.—Kawano, Wase, Owari, Silverhill.

Grapefruit.—Marsh (the most important variety), Walters, Duncan. *Pink-fleshed varieties*: Foster, Thompson.

Lemons.—Perrine, Meyer.

⁸ Comparatively little definite information exists in regard to the range of adaptability of different persimmon varieties. This list includes the principal sorts that are to be found in the South Atlantic and Gulf States. Tanenashi is probably grown more extensively at present than any other sort. The Eureka has proved especially hardy and desirable in Erath County, Tex., about 60 miles southwest of Fort Worth, and also at one or two points considerably farther north. The Tamopan is a Chinese variety and may possess a greater degree of hardiness than was formerly supposed. Zenji is one of the earliest varieties. Costata and Ormond may be too late to grow in most parts of district 4.

⁹ Gailey is not of value for its fruit, but, unlike the other varieties, the tree has both pollen-bearing and fruit-producing blossoms. As a rule, these two types of blossoms are borne on separate trees. While some varieties produce fruit without pollination, others do not; hence in planting persimmons it is advisable to include a pollen-producing sort.

¹⁰ The Celeste is regarded as the hardiest variety of this group, and Brown Turkey perhaps only slightly less so. The former is much more widely planted than any of the others named. In district 4 these two sorts should be planted, if any, in preference to the others, except in a few especially favorable localities.

¹¹ The Magnolia is planted in the Gulf coast section of Texas nearly to the exclusion of other varieties. It is not satisfactory in other parts of district 5, except possibly in the south-western part of Louisiana.

Grapefruit and oranges are grown commercially in Cameron, Hidalgo, and Willacy Counties, and to some extent in Brooks County, in southern Texas; and oranges south of New Orleans in Louisiana.

Limes.—Tahiti (or Persian). In southern part of Florida—Mexican or West Indian, commonly called "Key lime" (a group not a variety term) on the Florida Keys.

Limequats, citranges, tangelos, and certain other hybrid citrus fruits have value for home use in some parts of Florida and possibly in the warmer portions of other parts of district 5.

Other fruits requiring a subtropical climate, which occur more or less, include the avocado, guava, banana (hardy types for local use only), papaya (melon papaw), loquat, feijoa, and many others including several fruits suited only to the most nearly frost-free sections, such as the pineapple, mango, sapodilla, cherimoya, sugar-apple, ceriman, and others.

DISTRICT 6

District 6 includes the Ozark section in northwestern Arkansas, southwestern Missouri, and eastern Oklahoma and other fruit sections of the central Mississippi, lower Missouri, and Arkansas River Valleys. Many of the varieties suggested for this district are the same as for district 3.

VARIETIES SUGGESTED FOR DISTRICT 6

Apples.—*Early*: Yellow Transparent, Red June, Oldenburg (*Duchess*), Early Cooper, Wilson June, Summer Champion, Wealthy. *Midseason*: Grimes Golden, Jonathan, King David. *Late*: Delicious, Golden Delicious, York Imperial, Stayman Winesap, Rome Beauty, Turley, Winesap, Ingram.

Crab apples.—Same as for district 3.

Pears.—Tyson, Sheldon, Seckel, Kieffer, Garber, Douglas.

Peaches.—Mayflower (w c), Arp (y c), Early Wheeler (*Red Bird*) (w c), South Haven (y f), Belle (w f), J. H. Hale (y f), Elberta (y f).

Plums.—*Native and hybrid varieties.*—Wild Goose, Golden (*Gold*), Omaha, Monitor, Methley, Underwood, Superior. *Japanese varieties.*—Abundance, Burbank. *European or domestica varieties.*—Reine Claude (*Green Gage*), Lombard, Arctic (*Moore Arctic*), Italian Prune, Shropshire (*damson*).

The Missouri State Fruit Experiment Station makes favorable mention (Bulletin 29, Plums in Missouri) of plum varieties grown at that station as follows:

<i>Variety</i>	<i>Time of ripening</i>
Munson (hybrid)	Last of June
Red June (Japanese)	Second week in July
Black Beauty (hybrid)	Middle of July
Golden (<i>Gold</i>) (hybrid)	Last of July
Maynard (hybrid)	Do.
Gueii (European)	Second week in August
President (European)	First week in September
Italian Prune (European)	Second week in September

Cherries.—*Sour*: Early Richmond, Montmorency. *Sweet*: Gold, Wood (*Governor Wood*), Black Tartarian.

Raspberries.—*Red*: Latham, Chief. *Black*: New Logan, Cumberland. *Purple*: Potomac.

Blackberries.—Early Harvest, Mersereau, Eldorado.

Dewberries.—Lucretia, Mayes (*Austin Mayes*), Young (southern part).

Currants.¹²—*Red*: Perfection, London Market, Red Lake. *White*: White Imperial.

Gooseberries.¹²—Downing, Poonman (northern part), Glenndale (southern part).

Strawberries.—Dorsett, Fairfax.

Grapes.—*White*: Niagara, Rommel, Winchell. *Red*: Agawam, Catawba, Delaware, Lucile. *Black*: Campbell Early, Moore Early, Eclipse, Worden, Concord, Cynthiana.

¹² See statement, p. 36, for restrictions on planting.

DISTRICT 7

District 7, which includes the most of northern Illinois, nearly two-thirds of Iowa, southern Wisconsin, and a portion of eastern Nebraska, represents geographically the northward extension of district 6. The climatic conditions, especially winter temperatures, are more severe than farther south; consequently more attention needs to be given to the cold resistance of the varieties planted.

VARIETIES SUGGESTED FOR DISTRICT 7

Apples.—*Early*: Yellow Transparent, Charlamoff, Oldenburg (*Duchess*), Wealthy, Wolf River. *Midseason*: Grimes Golden, Jonathan, King David. *Late*: McIntosh, Delicious, Golden Delicious, Rome Beauty, Salome, Willow Twig, Northwestern Greening.

Crab apples.—Whitney, Transcendent, Martha, Virginia. Among newer varieties—Dolgo, with Alexis as a pollinizer.

Pears.—Kieffer, Longworth, Beierschmitt, Patten, Mendel, Seckel, Flemish Beauty, Anjou.

Peaches.—Uncertain at the best in most parts of this district. In favorable seasons, the following varieties may fruit: Greensboro (w f c), Carman (w f c), Rochester (y f), South Haven (y f), Champion (w f c), Polly (wf).

Plums.—*Native and hybrid*: Miner, Omaha, Terry, Wyant, Patten, Desoto. Newer varieties originated by the Minnesota Agricultural Experiment Station of promise in this district include: Radisson, La Crescent, Underwood, Hemepin, Red Wing, Superior, Monitor, Elliot. Pollinizers suggested for these varieties include: Surprise, Wolf, Wyant, Rollingstone, Desoto, Hanska, Kaga, or Toka.

Cherries.—*Sour varieties only*: Early Richmond, Montmorency, English Morello.

Raspberries.—*Red*: Chief, Latham. *Black*: Cumberland. *Purple*: Potomac.

Blackberries.—Eldorado, Snyder.

Dewberries.—Planting not advised.

Currants.¹³—*Red*: Diploma, London Market, Red Lake. *White*: White Imperial.

Gooseberries.¹³—Downing, Poorman.

Strawberries.—Dorsett, Fairfax, Rockhill (everbearing).

Grapes.—*White*: Diamond, Niagara, Winchell. *Red*: Delaware, Goff, Lucile, Woodruff. *Black*: Campbell Early, Moore Early, Worden, Concord.

DISTRICT 8

District 8 includes the greater portions of central and southern Wisconsin, southern Minnesota, northern Iowa, considerable portions of South Dakota, Nebraska, the western half of Kansas, eastern Colorado, and Wyoming. Much of this district is characterized by low winter temperatures and drying winds. Most of that part of the district designated as 8, west (fig. 27), has very limited rainfall. Only hardy varieties or fruits that can readily be given winter protection should be planted. Shelterbelts, to break the force of the prevailing winds, are likely to add greatly to success with fruits in this district.

VARIETIES SUGGESTED FOR DISTRICT 8

Apples.—*Early*: Yellow Transparent, Anoka, Charlamoff, Oldenburg (*Duchess*). *Midseason*: Patten, Folwell, Wealthy, Wedge, Grimes Golden, Wolf River. *Late*: Brilliant, McIntosh, Cortland, Windsor, Jonathan, Delicious (p. 37), Salome, Haralson, Malinda, Northwestern Greening.

A few of these varieties will probably be more dependable in some sections if top-worked on very hardy stocks.

¹³ See statement, p. 36, for restrictions on planting.

In addition the South Dakota State Horticultural Society reports as hardy in most parts of the State some of the newer varieties, such as Melba, Early McIntosh, Lobo, Milton, and Macoun. These are all seedlings of the McIntosh. They probably require longer trial before a final appraisal of their merits can be made, but where they are adapted, they will undoubtedly prove of value.

Crab apples.—Whitney, Florence, Virginia, Hyslop, Dolgo.

Pears.—Parker, Douglas, Patten, Mendel, Sudduth.

Peaches.—Planting not generally advised. In most favorable sections, varieties listed for district 7 may survive and fruit in some seasons; varieties suggested for district 1 might be tried experimentally.

Plums.—Same as for district 7, but with special reference to the varieties originated at the Minnesota Experiment Station, particularly for 8, east. In addition: Emerald and Burwood.

Sand cherry—plum hybrids.—Oka, Sapa, Compass, Zumbra, Nicollet, with Compass as a pollinizer.

Currants.¹⁴—*Red*: Perfection, Diploma, Red Lake. *White*: White Grape.

Gooseberries.¹⁴—Champion, Carrie, Como, Columbus, Pixwell.

EAST

Cherries.—Early Richmond, Montmorency, English Morello (especially in Wisconsin in the Michigan lake-shore region).

Raspberries.¹⁵—*Red*: Chief, Latham. *Black*: Cumberland, Plum Farmer. *Purple*: Potomac.

Blackberries.—Eldorado, Snyder.

Strawberries.—Dunlap, Howard 17 (*Premier*), Dorsett, Fairfax, Beaver. *Everbearing*: Rockhill, Mastodon.

Grapes.—*White*: Niagara. *Red*: Lucile. *Black*: Alpha, Beta, Moore Early, Worden, Concord.

WEST

Gooseberry.—Columbus.

Because of limited precipitation, raspberries, blackberries, and strawberries are not likely to be very satisfactory in district 8, west, except under irrigation. If water can be applied and winter protection given, the same varieties as suggested for district 8, east, may prove of value. In addition, the Ohta, Newman, and Herbert raspberries are promising when given winter protection. Conditions are similar with reference to grapes. No varieties can be recommended for this section with assurance of success, but where irrigation and winter protection can be given the varieties suggested for district 8, east, may be worth trying.

Besides the named horticultural varieties, such native wild fruits as chokecherry, buffaloberry, currant, gooseberry, sand cherry, red haw, highbush cranberry, and perhaps others are useful for sauce, jellies, and other purposes. The Juneberry in its wild forms or the named selections, Success or Surprise, are of value.

The taller growing species, such as chokeberry, wild plum, and buffaloberry, may be planted as shelterbelts and serve the double purpose of protection and fruit production. The Russian mulberry and Russian apricots are very drought resistant and furnish some fruit. They are recommended for windbreak planting in the southern part of district 8, west.

¹⁴ See statement, p. 36, for restrictions on planting.

¹⁵ In many sections it is advisable to provide winter protection of the canes by bending them over and covering them with several inches of soil.

DISTRICT 9

District 9 has many of the characteristics of district 8, but in an intensified degree, especially with respect to extremes of winter temperature. It includes northern Wisconsin (except a small area in the extreme northern part of the State somewhat influenced in climate by the waters of Lake Superior), the central and northern portions of Minnesota, North Dakota, the northern part of South Dakota, and nearly all of Montana. While climatic and other conditions vary within the district, probably the combined extreme in severity of winter temperatures, limited precipitation, and desiccating winds to be found in any section of the United States occur within this district.

VARIETIES SUGGESTED FOR DISTRICT 9

Apples.—*Early*: Yellow Transparent, Anoka, Charlamoff, Oldenburg (or a bud sport, Red Duchess). *Midseason*: Patten, Folwell, Wealthy, Erickson, Anisim. *Late*: Hibernial, Wedge, Haralson.

Crab apples.—Same as for district 8.

Pears.—Not likely to prove hardy. If any are planted experimentally, varieties for district 8 may be tried.

Peaches.—Planting not advised.

Plums.—Radisson, La Crescent, Underwood, Hennepin, Tonka, Waneta, Red Wing, Superior, Kaga, Mendota, Elliot. *Pollinizers*: Surprise, Wolf, Wyant, Rollingstone, Desoto, Hanska, Kaga, or Toka.

Sand cherry-plum hybrids.—Oka, Opata, Compass, Zumbra; with Compass as a pollinizer for the other varieties of the group.

Cherries.—Not likely to prove hardy.

Raspberries.¹⁶—*Red*: Chief, Latham. *Purple*: Potomac.

Blackberries.¹⁶—Eldorado, Snyder.

Currants and gooseberries.—Same varieties as for district 8.

Strawberries.—Same as for district 8, with irrigation and winter protection.

Grapes.—The hardiest varieties are those named for district 1. Their adaptability to the conditions generally prevailing in this district is somewhat doubtful.

Native wild fruits.—Same as for district 8.

DISTRICT 10

District 10 is, in general, the southern part of the Great Plains. It includes western Oklahoma, the Panhandle section, and a considerable portion of central Texas and eastern New Mexico. The elevation reaches nearly 3,700 feet in the vicinity of Amarillo, Tex. It is an area of limited precipitation, considerable wind, and high evaporation. Temperatures drop to zero nearly every winter and occasionally considerably below zero. Summer temperatures at times are high and the atmosphere very dry. This district is not generally suited to fruit growing, yet on the more favorable sites, and especially where irrigation can be provided locally, planting fruit for home use is worth while.

VARIETIES SUGGESTED FOR DISTRICT 10

Apples.¹⁷—Red June, Helm (southern part only), Wilson June, Wealthy, Grimes Golden, Jonathan. (Panhandle section especially) Kinnard, Texas Red, Missouri Pippin, Ralls. Even the latest of these varieties will probably be ripe by September in many parts of the district.

¹⁶ Cane fruits, if planted, should be irrigated and, in many parts of this district, given winter protection by being bent over and covered with several inches of soil.

¹⁷ Apple, pear, and cherry trees should not be planted in soils where the cotton root rot occurs, as their roots are highly susceptible to this disease. The trees, if attacked, will not be likely to live long enough to justify their planting.

Crab apples.—Florence, Hyslop, Dart.

Pears.¹⁷—Bartlett. (Panhandle section especially) Seckel, Kieffer.

Peaches.—Southern part of district: Mayflower (w c), Mamie Ross (w c), Luttichau (w f), Pallas (w f), Leona (y f), Smith (w f). In Panhandle section: Early Wheeler (w c), Carman (w c f), J. H. Hale (y f), Dr. Burton (w f), Elberta (y f), Krummel (y f).

Plums.—Bruce, Burbank, America, Golden (*Gold*), Poole Pride, Golden Beauty; also Gonzales and Santa Rosa in the southern part of the district.

Sand cherry-plum hybrids.—Opata, Sapa, Compass.

Cherries.¹⁷—Early Richmond, Montmorency (Panhandle section especially).

Japanese persimmons.—Eureka, Hyakume (southern part).

Jujubes.—Same as for district 5 (southern part).

Raspberries.—Of doubtful value in this district.

Blackberries.—Crandall, Early Harvest (in more favorable sections).

Dewberry.—Young (*Youngberry*) (in more favorable sections), Mayes (*Austin Mayes*).

Strawberry.—Missionary.

Blackberries, dewberries, and strawberries are not likely to be of much value in this district without irrigation at times.

Currants and gooseberries.¹⁸—Varieties suggested for district 8 are as promising as any for trial.

Grapes.—Susceptibility to cotton root rot is an obstacle to successful grape growing where the soil is infested. The Champanel and Lomanto are said to be somewhat resistant to this disease. Other varieties reported to be hardy and vigorous in this district are Armalaga, Lukfata, and Elvicand.

Varieties suggested for planting where root rot is not a factor—*White*: Gold Coin, Hidalgo, Rommel. *Red*: Captivator, Ellen Scott, Headlight. *Black*: Bailey, Beacon, Carman, Cloeta, Lenoir, Herbemont, Fern Munson.

DISTRICT 11

District 11 takes in southern New Mexico and the extreme western part of Texas. Its characteristics are not very sharply differentiated from adjacent areas. Because of its southern location, even though with fairly high altitudes, the winter is not usually severe. Winter temperatures at El Paso rarely drop as low as 10° F.; summer extremes quite frequently reach 100° or above. At Mesilla Park in southern New Mexico, the winter extremes are lower and the summer extremes not so high as at El Paso. There are several irrigated districts in the Rio Grande and Pecos Valleys in New Mexico, and there is an irrigated district in the El Paso section in Texas in which fruits somewhat characteristic of a mild climate are being grown to a limited extent.

VARIETIES SUGGESTED FOR DISTRICT 11

Apples.—*Early*: Yellow Transparent, Early Harvest, Bledsoe, San Jacinto. *Midseason*: Grimes Golden, Jonathan, Delicious (or Starking). *Late*: Stayman Winesap, Winesap, Missouri Pippin.

Pears.—Giffard, Clapp Favorite, Bartlett, Seckel, Anjou, Clairgeau, Winter Bartlett, Winter Nelis.

Peaches.—Early Wheeler (*Red Bird*) (w c), Carman (w c f), Mamie Ross (w c), J. H. Hale (y f), Elberta (y f), Dr. Burton (w f).

Plums.—Japanese varieties not generally recommended because of early blossoming habits and danger of injury from frost. *Japanese hybrids*: America, Bruce, Golden (*Gold*), Hanska, Santa Rosa. *European or domestic*: Sugar, Italian Prune, Imperial Epineuse, Agen (*French, Petite*), Standard, Grand Duke, Shropshire (damson).

¹⁷ Apple, pear, and cherry trees should not be planted in soils where the cotton root rot occurs, as their roots are highly susceptible to this disease. The trees, if attacked, will not be likely to live long enough to justify their planting.

¹⁸ See statement, p. 36, for restrictions on planting.

Sand cherry-plum hybrids.—Opata, Sapa, Compass.

Cherries.—*Sour*: Early Richmond, Montmorency, English Morello. *Sweet*: Bing, Lambert, Napoleon, Schmidt. (Black Tartarian is desirable as a cross-pollinizer for most other sweet varieties.) *Duke varieties*: Late Duke; New Century.

Raspberry.—*Red*: Van Fleet.

Blackberries.—Early Harvest, Crandall, Dallas, McDonald. (The latter is self-sterile. The Dallas may be used as a cross-pollinizer.)

Dewberries.—Young (*Youngberry*), Mayes (*Austin Mayes*).

Strawberries.—Klondike. *Everbearing*: Mastodon, Progressive.

Grapes.—At the New Mexico Agricultural Experiment Station, located in the southern part of the State, the following European (*vinifera*) varieties have done well when given winter protection, especially for the first several years after planting: Ribier, Black Hamburg, Alexandria (*Muscat of Alexandria*), Mission, Cornichon, Tokay, Malvoisie. American varieties that gave the best results at the experiment station are Niagara (white), Agawam (red), Salem (red), and Concord (black). It is probable that some of the varieties suggested for district 10 would prove of value in this district.

The European varieties should be given winter protection, at least for the first few years after they are planted or until the vines have become thoroughly established; further, they should be propagated on resistant understocks to avoid injury from phylloxera.

DISTRICT 12

District 12 is exceedingly variable, since it includes the Intermountain States, which are characterized by the high altitudes of the Rocky Mountains and by valleys provided with irrigation facilities, where intensive types of agriculture, including fruit growing, are carried on. From the standpoint of fruit growing, this district is made up of at least three zones. The conditions are adverse to fruit growing, practically to the point of being prohibitive, except possibly for some of the hardy native fruits, at altitudes exceeding about 7,000 to 8,000 feet. A second zone is represented by the irrigated valleys, in which a wide range of fruits and other crops can be grown. The third zone is represented by the areas where crop production of all kinds is restricted, or attended with considerable difficulty on account of very limited rainfall and where irrigation cannot be or has not been provided.

While conditions vary from north to south, the varieties suggested for growing throughout this district, especially in the more favorable zone, are very similar.

In southern Utah, the northern portion of Arizona, and some parts of Nevada, high-temperature conditions tend to preclude the growing of such fruits as the apple, cherry, currant, and gooseberry, except at the higher altitudes. Low precipitation is also a limiting factor in many parts of this district where irrigation is not practiced.

VARIETIES SUGGESTED FOR DISTRICT 12

In the nonirrigated areas, especially at the higher elevations, many of the varieties suggested for district 8 are likely to prove as satisfactory as any. In the irrigated valleys extensive fruit-growing enterprises exist. The varieties named below include the more important commercial sorts.

Apples.—*Early*: Yellow Transparent, Red Astrachan, Oldenburg (*Duchess*), Jefferis, Gravenstein, Bietigheimer. *Midseason*: Winter Banana, King David,

Jonathan. *Late*: McIntosh, Delicious, Esopus Spitzenburg, Golden Delicious, Stayman Winesap, Rome Beauty, Yellow Newtown, Winesap.

Crab apples.—Transcendent, Hyslop, Yellow Siberian.

Pears.—Bartlett, Hardy, Clairgeau, Comice, Howell, Bosc, Anjou, Flemish Beauty, Winter Nelis, Lawrence, Easter Beurre. The Gorham, a recent introduction, has been given favorable mention in Delta County, Colo.

Peaches.—Slappey (y f), Candoka (y f), J. H. Hale (y f), Elberta (y f).

Apricots.—Gilbert, Royal, Tilton, Blenheim, Moorpark.

Nectarines.—Boston, Quetta, Stanwick.

Plums.—*Japanese varieties*: Red June, Abundance, Burbank, Satsuma, Climax (hybrid). *European or domestica*: Bradshaw, Lombard, Reine Claude (*Green Gage*), Washington, Yellow Egg, Pond, Tragedy.

Prunes.—Italian Prune, Agen (*French, Petite*), Imperial Epineuse.

Cherries.—*Sour* (very few grown): Early Richmond, Montmorency, English Morello. *Sweet*: Bing, Lambert, Napoleon, with Black Tartarian, Schmidt, or Yellow Spanish as a cross-pollinizer.

Raspberries.—*Red*: Cuthbert (in milder valleys), Chief, Latham. *Black*: Cumberland.

Blackberries.—Eldorado, Lawton, Snyder, Evergreen.

Dewberries.—Lucretia, Young (*Youngberry*).

Currants.¹⁰—*Red*: Perfection, Red Lake. *White*: White Imperial.

Gooseberries.¹⁰—Oregon, Poorman.

Strawberries.—Marshall, Blakemore, Howard 17 (*Premier*), Narcissa, William Belt, Rockhill (everbearing). In the southern part—Klondike; *Everbearing*: Mastodon, Progressive, Gem.

Grapes.—In the milder portions of district 12, especially in the southern part, some of the European (vinifera) varieties may be grown, the Sultanina (*Thompson Seedless*) being the favorite. In some parts of Idaho and Oregon, with winter protection, the more hardy varieties of the vinifera grapes have given fairly good results. These include such sorts as the Black Hamburg, Chasselas de Fontainebleau, Flame Tokay, Jura Muscat, Sylvaner, and Zinfandel. American varieties suggested for trial planting in this district—*White*: Diamond, Niagara, Winchell. *Red*: Brighton, Goff, Delaware. *Black*: Concord, Campbell Early, Isabella, Worden.

DISTRICT 13

District 13 includes the western parts of Washington and Oregon and northern California. Tree fruits are not of large commercial importance in western Washington, except plums and prunes in Clark County, bordering the Columbia River. Certain small fruits are grown extensively in western Washington. In western Oregon in the Willamette, Rogue River, and other valleys there are rather extensive orchards.

VARIETIES SUGGESTED FOR DISTRICT 13

Apples.—Most of the varieties in the list for district 12 occur in district 13. However, in the Puget Sound section other varieties, such as Wealthy, Wagener, Alexander, Tompkins King, Rhode Island Greening, Baldwin, and Northern Spy, are of some importance for home use.

Crab apples.—Transcendent, Hyslop.

Pears.—Bartlett, Howell, Bosc, Anjou, Comice, Winter Nelis.

Peaches, plums, prunes, apricots, and cherries.—Substantially the same as for district 12.

Raspberries.—*Red*: Cuthbert, Antwerp, Chief. *Black*: Munger.

Blackberries.—Eldorado, Evergreen, New Logan.

Dewberry.—Young (*Youngberry*).

Currants.¹⁰—*Red*: Perfection. *White*: White Imperial.

Gooseberry.¹⁰—Oregon, Poorman.

¹⁰ See statement, p. 36, for restrictions on planting.

Strawberries.—Narcissa, Marshall, Corvallis, Ettersburg 121, Redheart (for canning), Rockhill (everbearing).

Grapes.—Not all sections of district 13 are favorable for grape growing, but the American varieties suggested for district 12 are likely to give as good results as any. Island Belle, a variety somewhat similar to Concord and of about the season of Moore Early, is grown to some extent in western Washington.

DISTRICT 14

District 14 includes the most of California and southern Arizona. It admits of almost endless subdivision, since within its boundaries there are localities in which the climate is distinctly subtropical and also those in which there is nearly perpetual snow. Within the deciduous fruit-growing sections of California the conditions naturally admit of division into coastal, interior valley, and foothill sections. Because of such wide divergence of conditions it is inherently difficult to suggest varieties for planting on a district basis. The varieties listed below are, however, widely distributed. Lists of some of the more important subtropical fruits grown in southern California and in Arizona follow the lists of deciduous fruits. Low precipitation is a limiting factor throughout the greater portion of this district where irrigation is not practiced.

VARIETIES SUGGESTED FOR DISTRICT 14

Apples.—While there is considerable difference in the adaptability of varieties to the different sections of California, those named in the list for district 12 have a wide range of adaptability and comprise the most important sorts grown in district 14, aside from the Yellow Bellflower and Yellow Newtown, which are grown largely in the Pajaro Valley, and the Gravenstein, which is produced in large quantities about Sebastopol, in Sonoma County. These three varieties make up a large proportion of the commercial apple industry of California.

Pears.—Bartlett, Howell, Comice, Bosc, Anjou, Winter Nelis.

Peaches.—Mayflower (w c), Babcock (w f), Hale Early (w f), Rochester (y f), Early Crawford (y f), Fay Elberta (y f), J. H. Hale (y f), Elberta (y f), Muir (y f), Lovell (y f), Salwey (y f). *Yellow clingstone varieties for canning:* Paloro, Peak, McDevitt, Sims, Phillips, Levi.

Plums.—(Named in approximate order of ripening.) Beauty, Formosa, Santa Rosa, Climax, Tragedy (d), Burbank, Duarte, Graviola, Wickson, Diamond (d), Kelsey, Sugar (d), Grand Duke (d), Giant (d), Président (d). (Varieties followed by letter (d) are domestica or European plums; others not so marked are either Japanese or Japanese-hybrid varieties.)

Prunes.—The Agen (*Petite, French*) is the principal variety grown in California for drying; the Italian Prune is the correspondingly important one in the Northwest. Other varieties as Imperial Epineuse, Sergeant (*Robe de Sergeant*), and Sugar are also dried to some extent.

Cherries.²¹—*Sweet:* Chapman, Black Tartarian, Napoleon (*Royal Ann*), Bing, Republican, Lambert.

Apriots.—Blenheim, Newcastle, Royal, Tilton, Moorpark.

Figs.—Adriatic, Kadota (probably same as Dottato), Mission, Smyrna type.²²

Olives.—Mission, Manzanillo, Ascolano, Sevillano.

Japanese persimmons.—Gosho, Hachiya, Hyakume, Tanenashi, Yemon.

²¹ See comment on pp. 33-34 concerning the self-sterility and intersterility of sweet cherry varieties.

²² Several varieties of figs of the Smyrna type are grown in district 14. In parts of California they have been planted on a large commercial scale. The Lob Ingir variety is the one of principal importance. This fruit in California is generally known as the California fig. Smyrna figs require caprification (which corresponds to pollination in other fruits) in order to develop fruit. For this, caprifig trees and the fig insect, or *Blastophaga*, which effects caprification, must be provided. The amateur grower not otherwise informed should seek farther advice before planting figs of this type.

Pomegranates.—Wonderful, Papershell, Spanish Ruby, Sweet Fruited, Subacid.
Raspberries.—*Red*: Cuthbert (northern California), Surprise (southern California).

Blackberries.—New Logan, Himalaya, Lawton (northern California), Crandall (southern California and Arizona).

Dewberries.—Young (*Youngberry*), Boysen (*Boysenberry*).

Currant.²³—*Red*: Perfection (northern coast section).

Gooseberry.²³—Oregon (northern coast section).

Strawberries.—Marshall (Fresno and northward), Brandywine, Blakemore (southern California only), Arizona (in Arizona).

Grapes.—In this district the European (vinifera) varieties are grown nearly to the exclusion of American sorts. On account of the destructiveness of the phylloxera the vines should be propagated on stocks or roots resistant to that insect except in the case of the direct producers, which are themselves resistant to the phylloxera.

District 14, as outlined in figure 27, includes nearly the same area as district 13 in Farmers' Bulletin 1689, Grape Districts and Varieties in the United States. The following paragraphs are quoted from that bulletin:

Except for a number of developments in the southern part of Arizona in recent years, the grape production of district No. 13 [district 14 for present purposes] is located entirely in California.

In the southern part of this district, and in the southern half of California, which includes the principal raisin-producing section, the following are the important varieties grown²⁴: Muscat of Alexandria*, Sultanina* (*Thompson Seedless*), Malaga, Listan (*Golden Chasselas*), Zinfandel*, Alicante Bouschet*, Feher Szagos*, Emperor, Sultana*, Mission*, Panariti*, Ohanez, Hunisa, and Castiza.

From the central portion of California to and including the northern end of district No. 13, the choicest varieties for table, storage, juice purposes, and shipping grapes have been grown, among the more important being Alicante Bouschet*, Calmette*, Carignane*, Black Hamburg, Black Prince, Burger*, Cabernet Sauvignon*, Chablis*, Chasselas Dorè, Chauche Gris*, Chauche Noir*, Cinsaut, Cornichon, Ferrara, Flame Tokay, Green Hungarian*, Grenache*, Gros Guillaume, Mataro*, Mission*, Mourastel*, Muscateller, Olivette Blanche, Ohanez, Panariti*, Pedro Ximenes*, Petit Syrah*, Prune de Cazouls, Sauvignon Vert*, Semillon*, Sultanina*, Sylvaner*, Valdepenas, Veltliner*, and Zinfandel*.

Under present conditions the following varieties are suggested for the various purposes for which grapes are now used. For juice purposes—Petit Syrah*, Grenache*, Carignane*, Alicante Bouschet*, Mission*, and Palomino*; for juice and table-grape purposes—Gros Guillaume, Prune de Cazouls, Black Hamburg, Muscat Hamburg, Black Prince, and Alexandria; for shipping—Castiza, Gros Guillaume, Ohanez, Emperor, Cornichon, Olivette Blanche, Muscat Hamburg, Monukka, Prune de Cazouls, Terret Monstre, and Red Muscat; for raisins—Alexandria, Monukka, and Sultanina; for currants—Panariti.

VARIETIES SUGGESTED FOR THE SUBTROPICAL SECTIONS OF DISTRICT 14

Oranges.—Washington Navel, Valencia.

Lemons.—Lisbon, Eureka.

Grapefruit.—Marsh.

Avocados (southern California in particular).—Fuerte (season, November to June), Nabal (season, June to September), Puebla (season, November to February). Many other varieties are grown, but their value is not as thoroughly established as that of those named.

Dates.—Deglet Noor, Halawy, Iteema, Khadrawy, Zabedy, Hayany, Saidy. (All require artificial pollination in order to produce fruit.)

Other fruits grown in limited quantities in the warmer parts of this district include the cherimoya, loquat, guava, feijoa, passion fruit, and occasionally other less well known kinds.

²³ See statement, p. 36, for restrictions on planting.

²⁴ Varieties marked with an asterisk (*) are particularly useful for juice purposes.